# Metal Finishing

POLISHING AND BUFFING • BARREL FINISHING • CLEANING
PLATING • ANODIZING • RUST PROOFING • LACQUERING & ENAMELING

AUGUST, 1959

CONTENTS:

**A.E.S. Convention and Exposition**
*Highlights of Activities*

**Electrodeposition of Chromium Alloys**
*A Literature Review*

**Analysis of Sulfuric Anodizing Solutions**
*Methods of Control*

**Bright, Non-Brittle Acid Copper Deposits**
*New Russian Development*

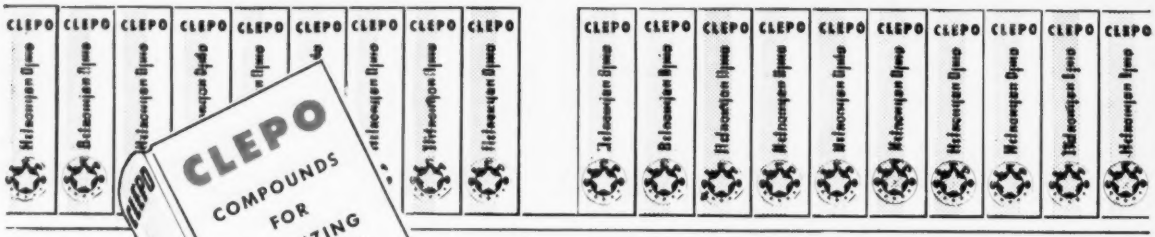
**Health Legislation Concerning Paint Ingredients**
*Lead and Chemical Compounds*

**Science for Electroplaters**
*Copper Plating — II*

**Complete Contents Page 45**

*Read and pass on—*

LIBRARY OF CLEPO SERVICE



CLEPO 28-AS

CLEPO 86-P

CLEPO 180-K

CLEP-ETCH "A"

THE COMPOUNDS PROVED MOST EFFECTIVE IN PREPARING ALUMINUM FOR ANODIZING

CLEPO 90-J

CLEPO 30-R

So thoroughly proved are these CLEPO compounds that we are inclined to issue a warning: don't attempt to anodize aluminum *without* using CLEPO-made formulations for preparing your aluminum parts for this treatment. For CLEPO compounds will definitely:

- remove oil and dirt without attacking the base metal
- remove buffing compounds without tarnishing the highest polish on the aluminum
- remove oxide and scale without dangerous acid
- remove smut after etching without fuming or hot acid
- remove smut from silicon-base alloys without hydrofluoric acid
- remove anodize coatings from rejects or racks without hot solutions

These are six outstanding CLEPO compounds useful in the field of anodizing, each formulated to do certain jobs best.

If your production involves anodizing, phone or write to have a CLEPO Field Service man call to demonstrate the benefits CLEPO compounds can bring you. Or if you have some particular steps that are bothering you and want a quick answer, send us the details. We'll be glad to make recommendations and send you a trial sample.

FREDERICK GUMM *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N.J.

# ONE new dry acid does NINE jobs better

## ENTH-ACID 82

A free-flowing powdered blend of acid salts, activators and surfactants. Water soluble. Packed in non-returnable containers. Less expensive than 50% muriatic acid, superior activating and wetting ability. No special equipment needed. No special handling or safety problems. Non-fuming at room temperatures. Produces cleaner activated surfaces that allow shorter plating times.

1. Strips chromium rapidly without current
2. Prevents cloudy, stained nickel plate
3. Provides good adhesion on zinc die castings, copper and brass
4. Descales heat-treated, welded, or brazed steel without attack
5. Allows re-nickel plating on top of old passive nickel plate
6. Dissolves red rust
7. Activates steel prior to plating or phosphating
8. Prepares cast iron for plating
9. Removes soldering flux

*Write today for complete technical data. Enthone, Inc., 442 Elm Street, New Haven, Conn.*

ANOTHER PRODUCT OF Enthonics RESEARCH

ASARCO

**ENTHONE**

*A Subsidiary of American Smelting and Refining Company*

*To avoid copper and brass cleaning problems*

# ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS

## Electroclean copper and its alloys with speed—without tarnish

Oakite 191 gives fast, thorough action in electrocleaning brass and other copper alloys . . . simultaneously protecting against tarnish especially in reverse current tanks. Speeds removal of shop soils, smuts, light buffing compounds . . . provides an effective, non-tarnishing pre-soak for heavily contaminated parts.

But that's not all! It tolerates chromic acid drag-in . . . has high conductivity for efficient use of power . . . works well in hard water . . . rinses freely . . . has long life . . . no objectionable odor . . . won't form precipitate or water-break marks on the work.

Oakite 191 is one of a complete line of materials for cleaning any metal—even the problem ones. Ask the Oakite man. Or send for Bulletin F-9355. Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

*it PAYS to ask Oakite*

OAKITE® SCIENCE

50 1909-1959 years' leadership in industrial cleaning

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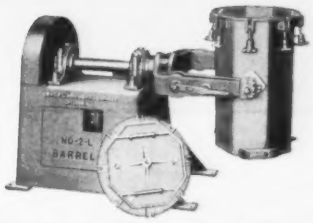
61 . . . . for 61 years!

*Manufacturing Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing*

**Chas. F. L'Hommedieu & Sons Co.**

**No. 18 — VARIABLE SPEED POLISHING LATHE**

Independent spindles—each with separate patented Variable Speed Drive and controls — ball-bearing throughout. Powered by two up to 25 H.P. motors. Adopted by leading manufacturers as standard equipment.



**TYPE L — DOUBLE ACTION BARREL**
**For ABRASIVE TUMBLING or BALL BURNISHING**

The cylinder can be operated at an angle for producing a double tumbling action—thus producing a better and more uniform finish in a much shorter time.

Longer pieces finished more uniformly and without bending.

RELIANCE KUL-KUT BUFFS
FOR FAST CUTTING

RELIANCE EXTRUDED COMPOSITIONS
STANDARD SIZE
2 x 2 x 10"

**THEY CUT • THEY CLEAN • THEY COLOR**

- **DURABILITY**
- **PRODUCTION**
- **ECONOMY**
- **EFFICIENCY**

***THE ANSWER TO INCREASED PRODUCTION AT LOWER COST!***

*Manufacturers of Metal Finishing Equipment and Supplies*

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Branches:
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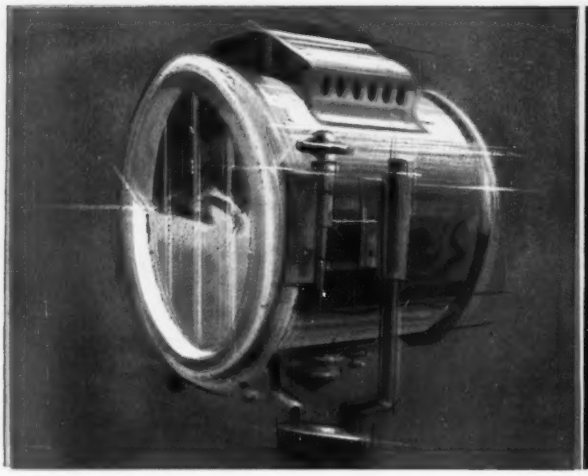
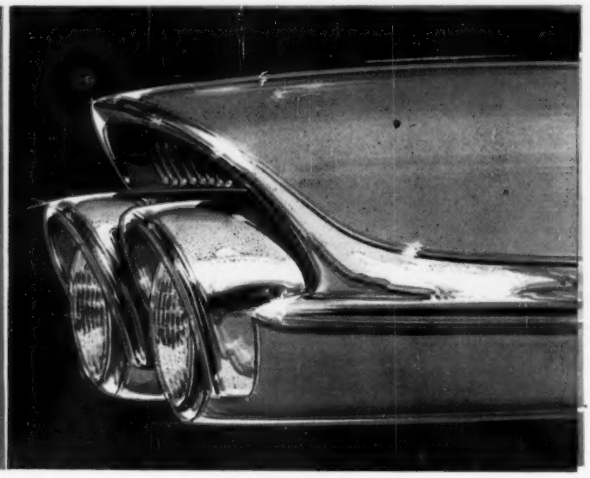
# Half a century apart . . .

## both finished by Acme machines!



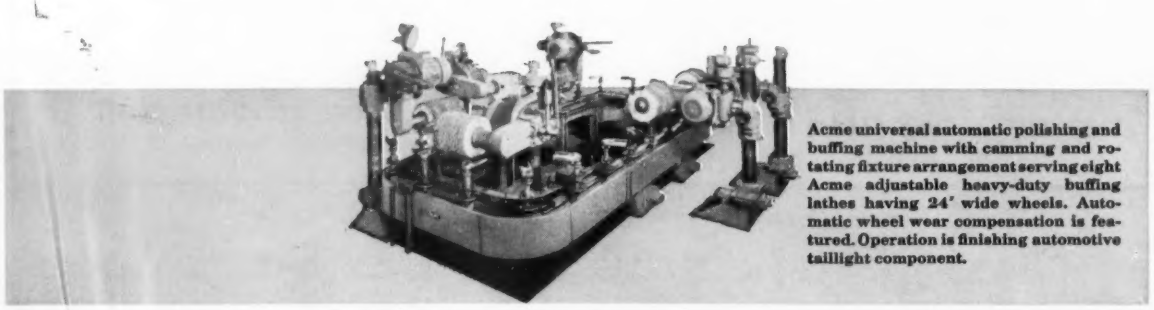


Even in 1910, part of an owner's pride in his car lay in gleaming brightwork. But polishing and buffing the shiny metal that he loved so well caused manufacturers plenty of headaches. And so they turned to Acme—and Acme has continued to supply the answers to their finishing problems.

Today, Acme engineers combine standard units with a variety of accessories to make custom polishing and buffing machines. Large corporations and small job shops alike use Acme machines to reduce rejects, increase production volume, machine finish odd-shaped pieces.

Every year of its history, Acme has encountered new finishing requirements—each an individual problem—and solved them. Chances are, we can solve your problem, too. Send for illustrated 16-page catalog today.

## 50 years of *Polishing Off* your finishing problems



**Acme universal automatic polishing and buffing machine with camming and rotating fixture arrangement serving eight Acme adjustable heavy-duty buffing lathes having 24' wide wheels. Automatic wheel wear compensation is featured. Operation is finishing automotive taillight component.**

# ACME MANUFACTURING COMPANY

1400 E. 9 MILE ROAD, DETROIT 20, MICHIGAN

LEADING PRODUCERS OF AUTOMATIC POLISHING AND BUFFING EQUIPMENT SINCE 1910

**You see these words** in just about every store you go into. They express what the owner feels—gratitude for your visit, and the hope you'll visit him again.

These words just about sum up the way we feel about the many plating friends who stopped by our Booth at the 5th Industrial Finishing Exposition in Detroit. We thank them for coming to see us, and hope to see them again — soon.

## *At our Booth, we displayed:*

- **Our newest silicon rectifier — with Ferromagnetic protection.**
- **Rapid Germanium Rectifiers — Automatic voltage and current stabilization.**
- **Rapid Selenium bench models.**
- **Rapid Quality Components — The "hearts" of our units.**

**Miss the show? We'll be glad to send you descriptive literature on any or all of our products. Just write to Rapid Electric Company, 2881 Middletown Road, New York 61, N. Y.**

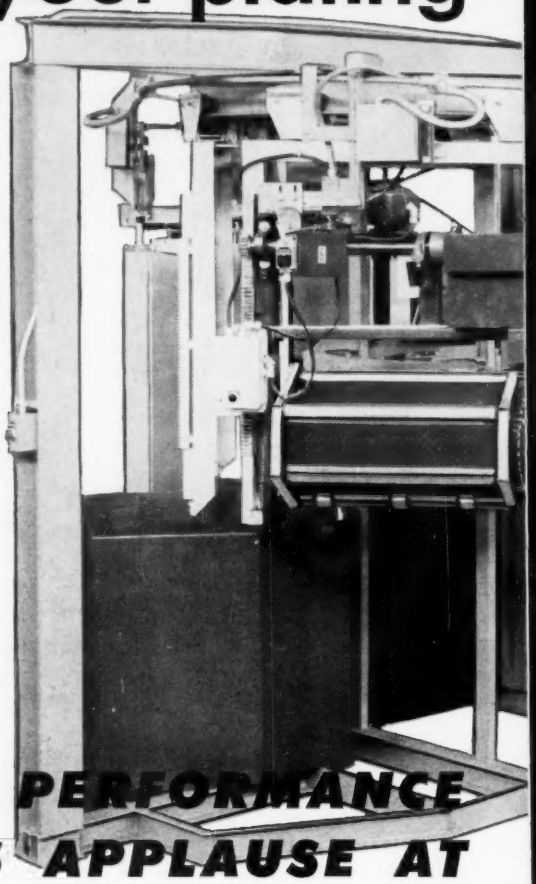
THE NAME THAT MEANS *"More Power to You!"*

# RAPID ELECTRIC COMPANY

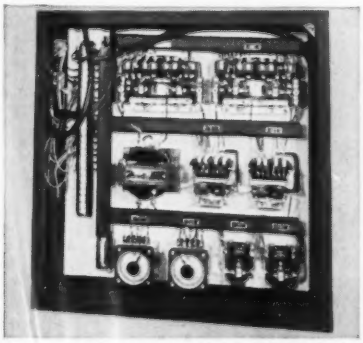
**The V.I.P. is "Star" of A.E.S. Convention-Exposition**

**Seen by visitors on television and plant tours, the V.I.P. is here described by mistress-of-ceremonies on closed circuit telecast to the floor of the metal finishing show.**

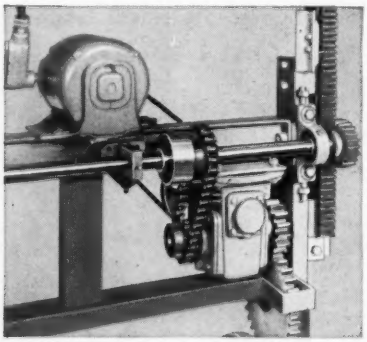
# UDYLITE'S VIP* of your plating



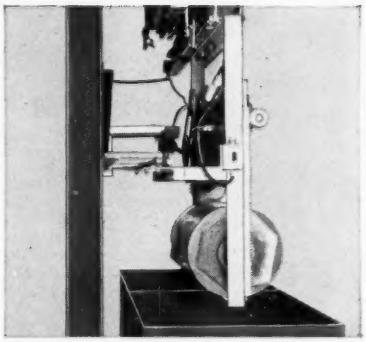
## EXCITING PERFORMANCE BRINGS APPLAUSE AT



Reversing starters for lift and transfer motors, adjustable timers for delayed dips, down-dwells and drag-outs, and the relays for automatic machine operation are all centered in this single control panel.

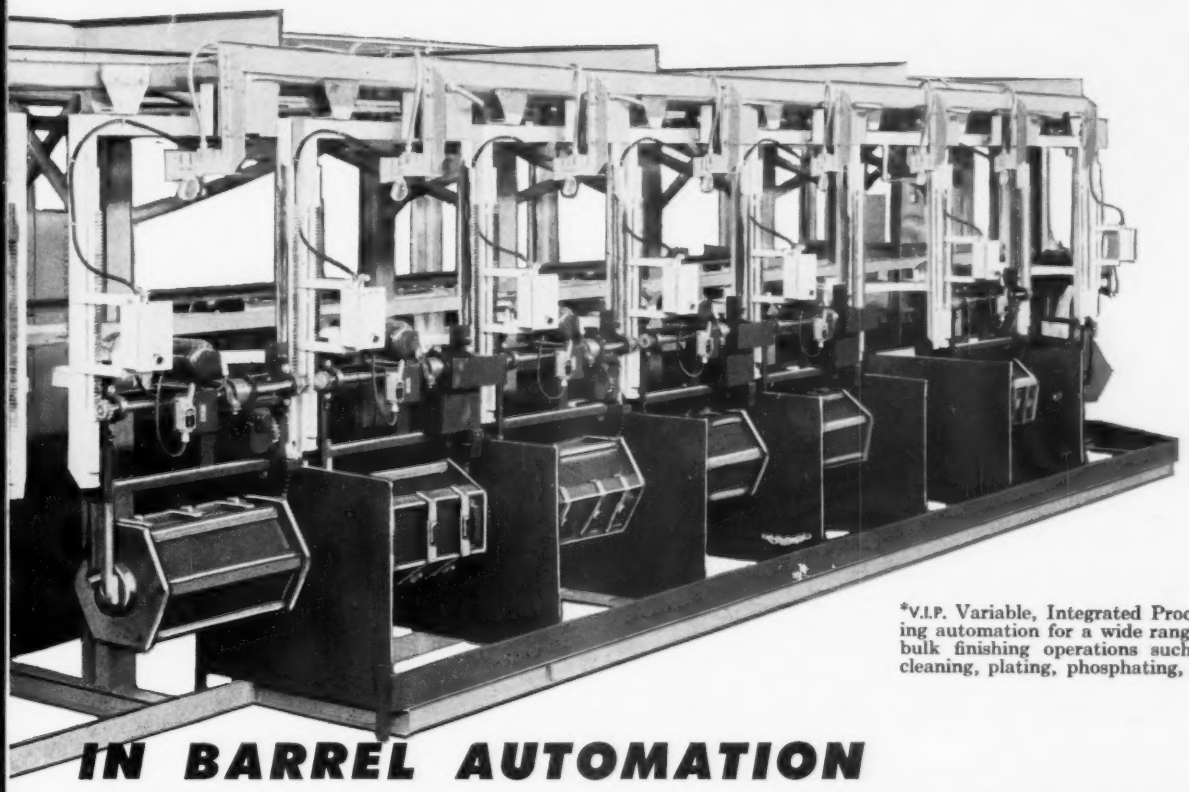


Individual power unit for each barrel and carriage assembly provides cylinder rotation in the "down position". When reversed, an over-running clutch grips the shaft to raise the barrel for transfer to next station.



Side view of the V.I.P. carriage unit shows complete accessibility, for simple easy servicing, of all parts, anodes and solutions. The ample clearance around each unit also provides for excellent ventilation of the machine.

# can be the STAR PRODUCTION



*V.I.P. Variable, Integrated Processing automation for a wide range of bulk finishing operations such as cleaning, plating, phosphating, etc.

## IN BARREL AUTOMATION EXPOSITION FROM NOTED V.I.P.'S*

*(*very important platers)*

Executives, plating superintendents and engineers during the recent A.E.S. Convention were impressed and excited when they saw Udylite's new V.I.P. The extreme versatility of this new return type barrel machine was displayed in a way that amazed even automation experts. In action demonstrations, they envisioned new highs of cost cutting efficiency with this latest development of Udylite's equipment engineering team.

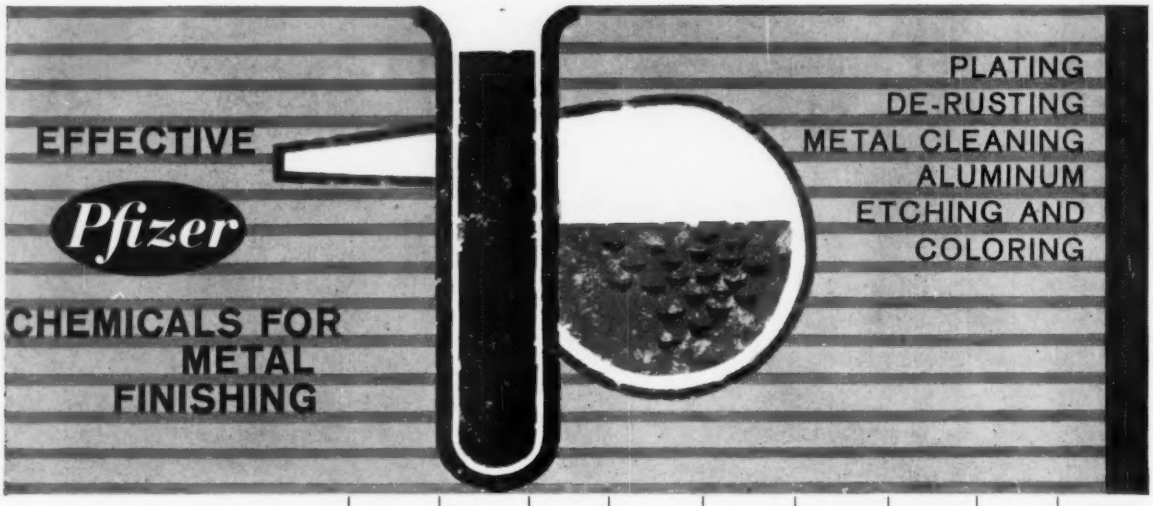
The result of years of careful study and intensive experiment is this hydraulically operated transfer system which puts a series of Udylite's famous long-life Tempron cylinders through an entire plating cycle . . . programmed by a single panel of adjustable controls. Guided by this "brain" the ingeniously simple "body" of the V.I.P. performs wonders of automatic processing.

When your production must be *both* fast and sure, here is what you can expect from the V.I.P.: High volume capacity coupled with the invaluable virtues of simple rugged construction, single, one man control and superb ease of maintenance. Above all, the amazing flexibility of this really versatile performer can establish the V.I.P. as the money making star of your finishing operations.

Learn today how the V.I.P. can, at once, raise your production and efficiency levels in a way you never before thought possible. Write, or see your Udylite representative for details, NOW!

the udylite corporation

detroit 11, michigan • world's largest plating supplier




| | Cleaning | Polishing | Pickling | Electroplating | Electropolishing | Non-Electrolytic Depositions | Electrolytic Oxidation | Etching | Gold Coloring of Aluminum |
|---|---|---|---|---|---|---|---|---|---|
| Citric Acid | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Sodium Citrate | ✓ | ✓ | | ✓ | | ✓ | | | |
| Ammonium Citrate | ✓ | ✓ | ✓ | ✓ | | | | | |
| Gluconic Acid | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Glucono Delta Lactone | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Sodium Gluconate | ✓ | ✓ | | ✓ | | | | ✓ | |
| Oxalic Acid | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Ammonium Oxalate | ✓ | ✓ | | ✓ | | | | | |
| Ferric Ammonium Oxalate | | | | | | | | | ✓ |
| Tartaric Acid | ✓ | | ✓ | ✓ | | | | ✓ | |
| Tartar Emetic | | | | ✓ | | | | | |
| Rochelle Salt | | | ✓ | ✓ | | | | | |
| Cream of Tartar | ✓ | | | ✓ | | | | | |

**Citric Acid...**
Nontoxic, mild, yet chemically active against scale and tarnish. Used extensively in the formulation of general metal cleaners and polishes, particularly household products.

**Sodium Citrate...**
A preferred ingredient in electroless nickel baths, resulting in a brighter plate. Also finds wide use in electroplating processes.

**Ammonium Citrate...**
Especially useful for the removal of rust in near neutral solutions. Extremely mild and safe to handle.

**Gluconic Acid...**
An excellent sequesterant in alkaline derusting solutions; provides rust-free, clean surface ready for further treatment. Also highly effective in aluminum etching and paint stripping compounds.

**Oxalic Acid...**
The most effective chemical for use in automobile radiator cleaners. Also finds wide use in electropolishing and as an ingredient in general metal cleaners.

**Ferric Ammonium Oxalate...**
Used extensively in the production of light-fast gold colored aluminum.

**Tartaric Acid...**
Excellent complexing agent for copper in electroplating.

**Tartar Emetic...**
Used in electrolytic baths for deposition of silver and antimony alloys on brass, copper and steel surfaces.

**Rochelle Salt...**
Increases efficiency and yields finer-grain deposit in alkaline copper plating.

**Cream of Tartar...**
An excellent additive for brass cleaning compounds. Its crystalline structure acts as an effective abrasive in paste polishes. Chemically active against tarnish.

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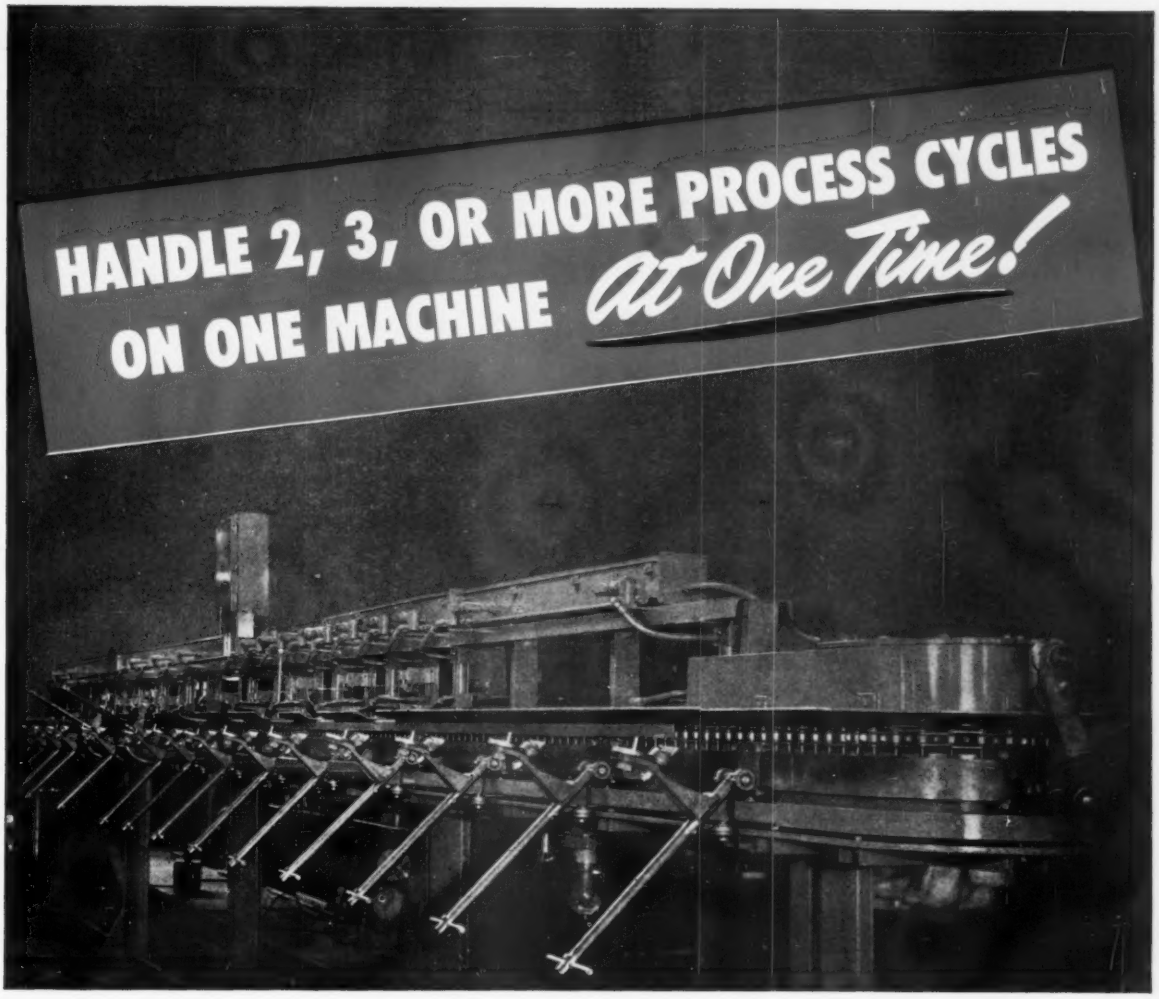


# LASALCO'S *Select-O-Matic*

## MULTIPLE PROCESS PLATER

Another Lasalco development that offers the industry the last word in *fully automatic* plating!

With the new Select-O-Matic, the operator simply selects the desired process cycle for individual racks, when loading the machine, merely by turning a dial on the carrier. From that point, the rack *automatically* travels through the entire selected cycle without further attention.

A single Select-O-Matic plater, manned by one operator, will handle several various processes simultaneously. Different machines for each process are eliminated—original investment in equipment is greatly reduced—much less floor space is needed—maintenance is cut to an absolute minimum.

The Select-O-Matic is easily adaptable to any operation. Tell Lasalco about *your* operation and requirements to learn what this new machine can do for *your* production and profits.

***Write Today!***

## LASALCO, INC.

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**IN TEXAS: 2805 Allen Street • Dallas, Texas • Riverside 7-5814**

# A Timely Message on

## New Facets of Alaska and Hawaii Statehood

## by Ben P. Sax

Chairman of the Board, *American Buff Company*

Many businesses in our 48 states have been feeling the effect of the addition of our 49th and 50th states. Depending upon their product, you'll hear the situation described as a great step up, or a costly step down.

Map-makers, for instance: an inventory of maps becomes junk — United States maps and all their related statistical information must be revised. Yet in turn, this creates a huge new market in schools, business and libraries, etc., where the latest authoritative information is a "must". So, too, with the entire flag industry. And in the field of games (of all places) what a change! One of the biggest game producers estimates that popular games based upon the 48 states will create obsolete stocks as high as 60,000 games with an approximate value of $175,000.00. One encyclopedia publisher estimates editorial changes for Alaska, alone, will affect over 300 pages.

But there's a shiny future of expanding markets for many metal products. Metal components as well as complete products will be on the rise, particularly in the new surge of Alaska homesteaders, and in the huge mass markets of Hawaii.

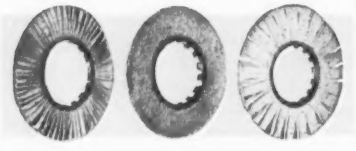
We hope that our know-how in helping the metal finisher to produce economically and beautifully will soon "show" in the possessions of our new U.S. citizens.

Sincerely,

Ben P. Sax

BEN P. SAX


**"For the job that's TOUGH—use an AMERICAN BUFF"**



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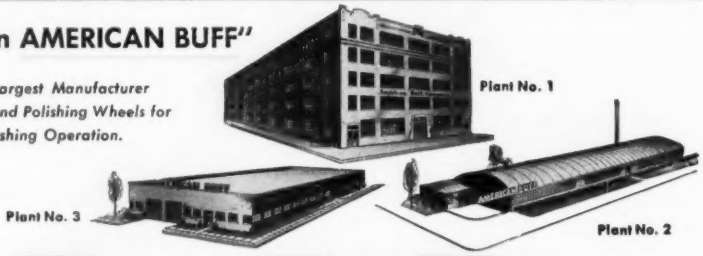


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# Now-28 ISOBRITE® PLATING BRIGHTENERS

## For Zinc, Cadmium, Copper and White Brass

## HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

**1. LONGER LIFE**

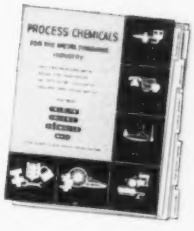
Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

**2. BRIGHTNESS**

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

**3. THROWING POWER**

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.




**4. WIDER BRIGHT RANGE**

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

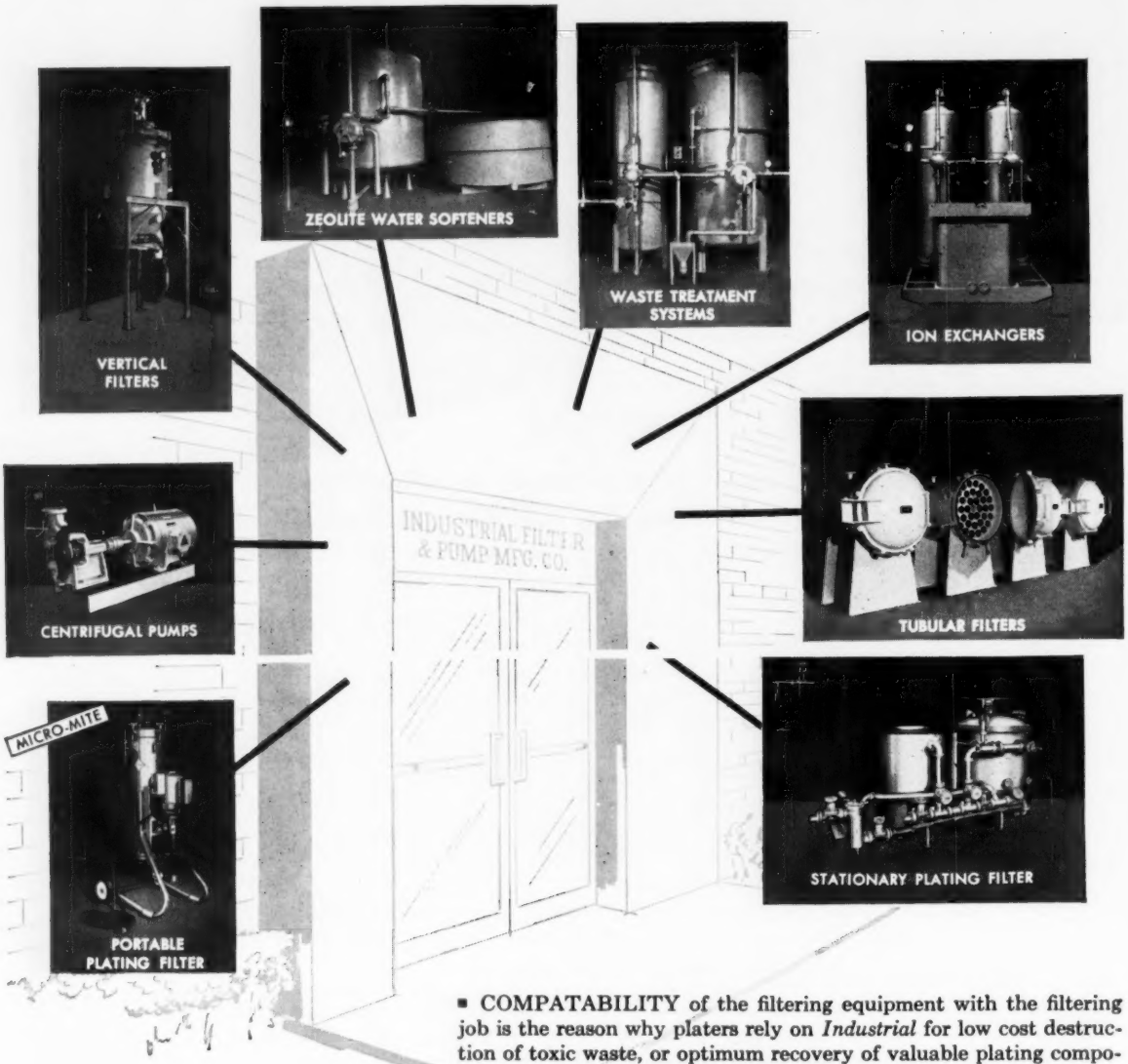
**Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.**

*Allied Research Products, Inc.* 4004-06 EAST MONUMENT ST., BALTIMORE 5, MD.
Branch Plant: 400 Midland Avenue, Detroit 3, Michigan
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

*Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing*

IRIDITE® Chromate Coatings | IRILAC™ Clear Coatings | ISOBRITE® Brighteners | ARP® Plating Chemicals | WAGNER Equipment

# INDUSTRIAL ENGINEERED EQUIPMENT for the PLATING INDUSTRY




■ COMPATABILITY of the filtering equipment with the filtering job is the reason why platers rely on *Industrial* for low cost destruction of toxic waste, or optimum recovery of valuable plating components. Cost consciousness holds the key to such compatability. *Industrial*-engineered systems deliver it by:

**A thorough appraisal** of your needs and understanding of your process by qualified chemists and engineers.

**Impartial recommendation** made possible by broad and versatile line of *Industrial*-engineered equipment.

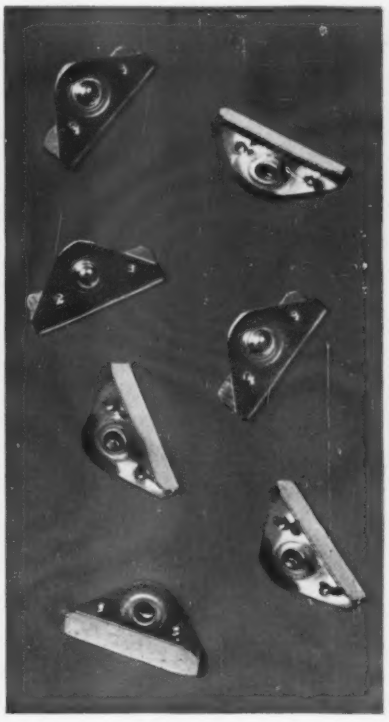
**Experience** backed by engineering and production facilities with a 30-year reputation for building only the *finest* plating equipment.

**Write for Bulletin: "MODERN FILTRATION FOR THE PLATING INDUSTRY"**

INDUSTRIAL

**INDUSTRIAL FILTER & PUMP MFG. CO.**
**5906 Ogden Ave., Cicero 50, Illinois**

**Lustrous appeal in lamp components.** A New Jersey job plating shop uses BURNEK 22 for bright burnishing lamp parts after brass plating. Parts are ball and self burnished for 30 minutes, rinsed, dried, and lacquered.



**Bright, stain-free handbag parts.** A company making handbags and pocketbooks uses BURNEK 22 for burnishing small steel frames, corners, and ornaments before bright nickel and gold plating. Parts are then rinsed and dipped in dilute sulfuric acid.

**Clean, scratch-free zipper pulls.** A large Eastern zipper manufacturer uses BURNEK 22 in open-end oblique barrels to remove stamping oil and bright burnish brass and steel parts. Parts are then ball burnished 45 minutes.

# Burnish parts mirror-bright at low cost with BURNEK 22!

Brass, copper, nickel, silver, gold – you name it, Wyandotte BURNEK® 22 can burnish it to a bright luster with exceptional savings! Even handles short runs on aluminum, zinc, steel, and stainless-steel parts.

Most important, BURNEK 22's low cost and short running time help you slash burnishing costs to the bone. So why wait? Call your Wyandotte representative for a revealing demonstration in your own plant. Do it today!

*Wyandotte Chemicals Corporation, Wyandotte, Michigan, Also Los Nietos, California, and Atlanta, Georgia. Offices in principal cities.*

Wyandotte CHEMICALS

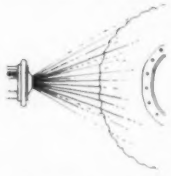
J. B. FORD DIVISION

*The Best in Chemical Products for Metal Finishing*

# J. J. SIEFEN CO.

## . . . AT YOUR SERVICE!

**J. J. SIEFEN FINISHING SYSTEMS FOR USE ON ALL TYPES OF AUTOMATIC MACHINES**



J. J. Siefen offers the necessary equipment to facilitate the finest workmanship at the most reasonable cost.

Why not call on J. J. Siefen engineers to give individual attention to your unique specifications.

### NUGLU—THE IDEAL ADHESIVE

For setting up or recoating Polishing Wheels, Abrasive Belts and Discs. NUGLU, a liquid glue developed to lengthen wheel life, produce a better finish and increase *Metal Finishing Production.*

### BRUSHING NUGLU

A mixture of NUGLU and graded Aluminum Oxide Grain. Save on operating costs, reduce wheel inventories and obtain *Greater* results with LESS costly material, in fine polishing work.

Use J. J. Siefen compounds for metal finishing • increase production and lower costs.

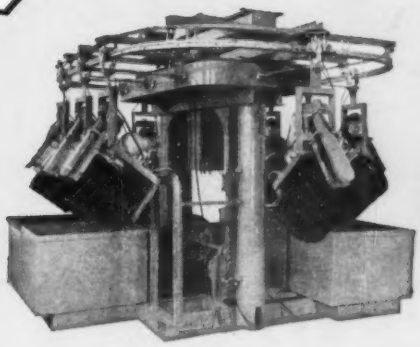
- **Stainless Steel**
- **Liquid Tripoli**
- **Liquid for Coloring**
- **Lapping Compound**
- **Burring Compound**
- **Bar (grease) Compounds**

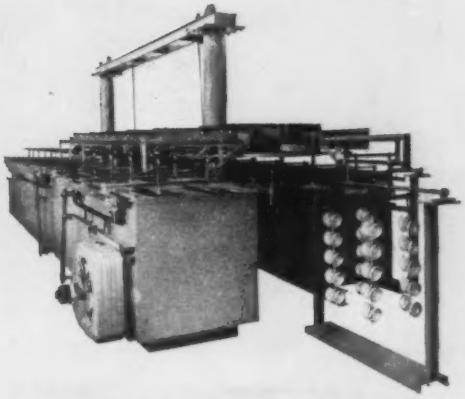
*Ask us for samples or send samples of your products for finishing.*

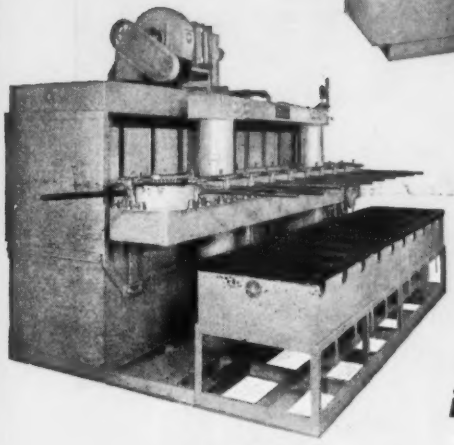
**J. J. Siefen CO.**

5657 LAUDERDALE DETROIT 9, MICH.

# CROWN AUTOMATICS



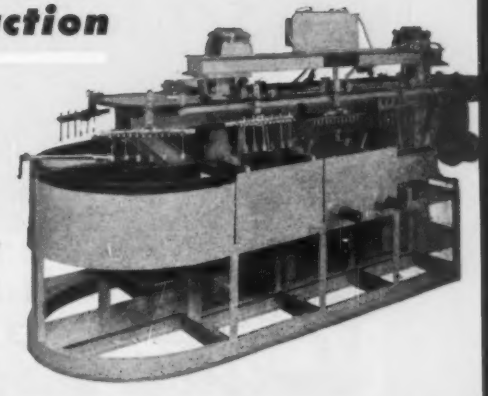


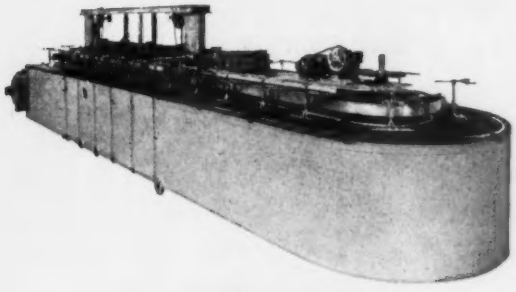


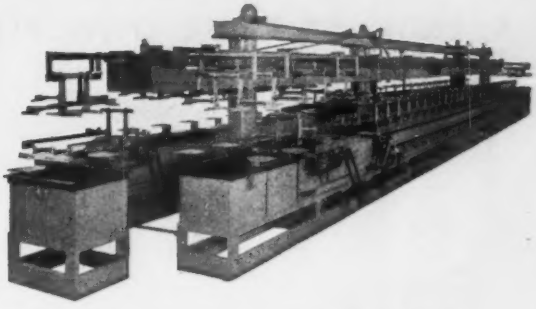
***increase production***

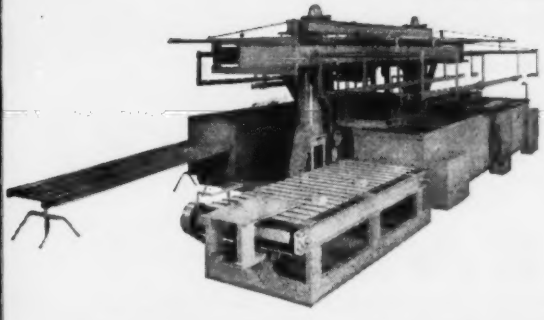
***reduce costs***

***improve quality***







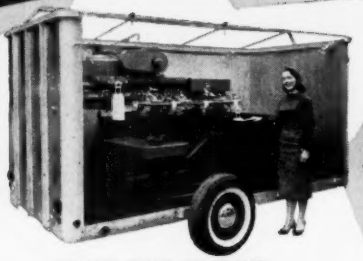


**Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry... *there is a model to fit your needs.* Write us details of your job and production requirements.**

## CROWN RHEOSTAT AND SUPPLY COMPANY

1965 PRATT BOULEVARD • ELK GROVE VILLAGE ILLINOIS

## NOW YOU CAN SEE "Little Steve" RIGHT IN YOUR OWN PLANT



BRING THIS STEVENS "ROAD SHOW" TO YOUR DOOR

Thousands of visitors to the A.E.S. Exposition saw the "Little Steve" automatic plating and processing machine in action. Perhaps you were one of the many who said they wished others in their organization could see this remarkable machine perform.

Now the mobile display model can be brought directly to you. At your request, a Stevens representative will arrange a special showing. "Little Steve" will be put through its paces before the eyes of your entire staff right in your own plant.

Avail yourself of this remarkable opportunity today. Merely send a request on your company letterhead and a private viewing of "Little Steve" will be promptly arranged. Just address your request to:

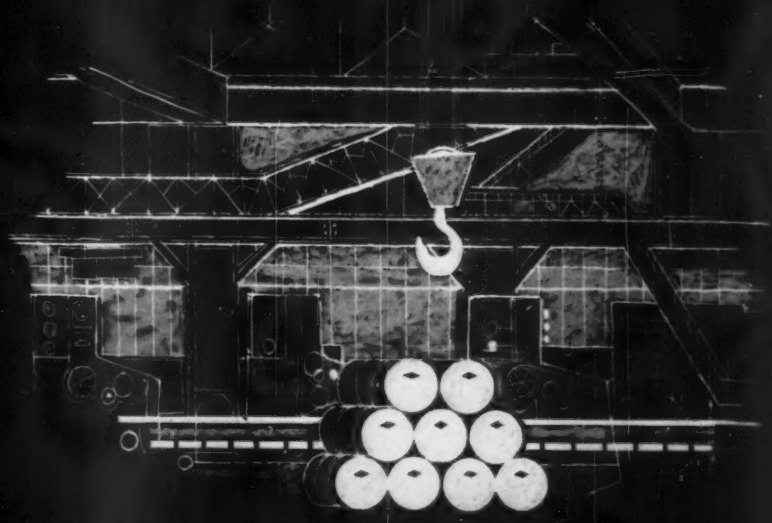
**frederic b. STEVENS, inc.**

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

***Remember* — When you go *automatic* . . . go STEVENS!**

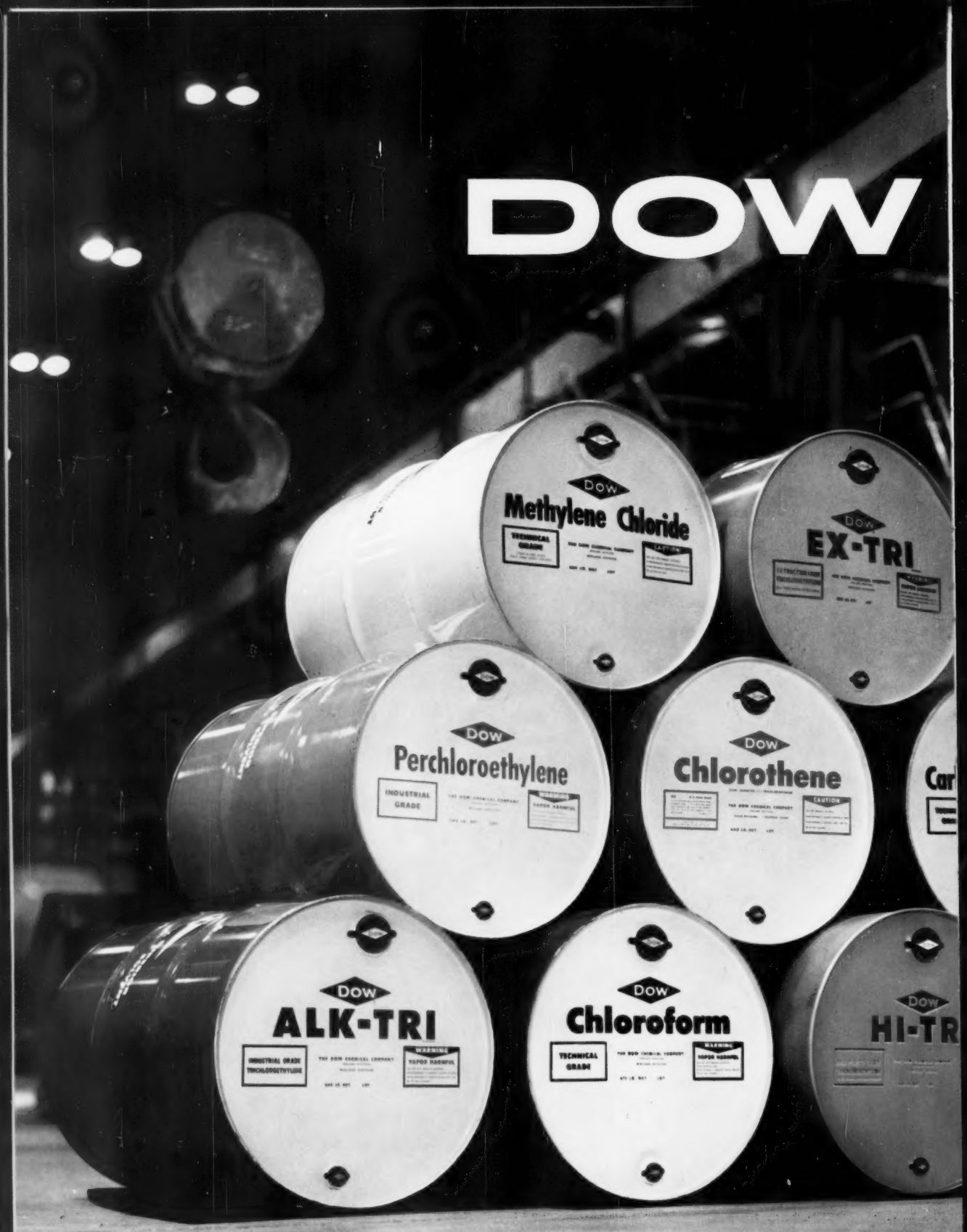
DOW | METAL CLEANING SOLVENTS



# 7 IMPORTANT REASONS WHY YOU SHOULD BUY SOLVENTS FROM A DOW DISTRIBUTOR

1. Distributors of Dow Solvents are local businessmen in your own community. They know the local customs, people, economic conditions.
2. They have large stocks of solvents near you. This guarantees fast delivery.
3. Technical service is located in your community or near you. Again fast service.
4. Distributors of Dow Solvents offer personalized service. If you need a product on a rush basis—or technical help—you will get it.
5. Dow stands behind each and every one of its distributors. They are chosen to be distributors of Dow Solvents, because of their ability to serve you best.
6. Because Dow makes the widest line of chlorinated solvents in the business, distributors of Dow Solvents can offer you the widest line to select from.

And, now, to learn of the seventh and equally important reason, turn the page . . .




New color code eliminates confusion when two or more different solvents are used in one plant.

# announces 9 new color coded drums with side and top labels

Dow's 9 chlorinated solvents—Chlorothene*, perchloroethylene, NEU-TRI*, EX-TRI*, ALK-TRI*, HI-TRI*, methylene chloride, carbon tetrachloride, chloroform—now have their own color coded 55 gallon drums. Equally important is the fact that all drums are now identified both on top and side! In fact, you can easily identify a drum at a distance of 100 feet. THE DOW CHEMICAL COMPANY, Midland, Michigan, Chemicals Merchandising Department 709

**DOW CHLORINATED SOLVENTS COLOR CODE**

Chloroform—black and white
Methylene Chloride—yellow and black
Perchloroethylene—orange and white
Chlorothene—green and white
Carbon Tetrachloride—black and yellow

ALK-TRI — cream and blue
EX-TRI—blue and light blue
NEU-TRI — blue and white
HI-TRI — blue and orange

*Trademark

Drums stacked on top of each other are now easily identified.

All Dow industrial solvent drums are clearly labeled top and side

For the name of your nearest distributor of DOW solvents, turn the page

DOW

# FOR HELPFUL METAL CLEANING INFORMATION
## get in touch with your Dow Solvents Distributor

DOW

**LETTER KEYS: (C)—Chlorothene®; (M)—Methylene Chloride; (P)—Perchloroethylene (Industrial); (T)—Trichloroethylene**

**ALABAMA**
BIRMINGHAM—Wittichen Chemical Company (C M P)
BIRMINGHAM—F. H. Ross and Company (C M P T)
MOBILE—Barada and Page, Inc. (C M)
MOBILE—McKesson & Robbins, Inc. (C M P T)
MOBILE—F. H. Ross and Company (C M P)
MONTGOMERY—Wittichen Chemical Company (C M P)

**ARIZONA**
PHOENIX—Braun Chemical Company (C M P T)
PHOENIX—Western Chemical Company (C M P)
TUCSON—Western Chemical Company (C M P)

**CALIFORNIA**
LOS ANGELES—Braun Chemical Company (C M P T)
LOS ANGELES—McKesson, Mefford Chemical Division (P)
LOS ANGELES—Pemaco, Inc. (P T)
OAKLAND—B. N. Meacham Company (C)
SAN DIEGO—Braun Chemical Company (C M P T)
SAN DIEGO—Buel Town Company (T)
SAN FRANCISCO—Braun-Knecht-Heimann Co. (C M P T)
SAN FRANCISCO—G. N Meacham Company (C)
SOUTH GATE—American Mineral Spirits (P)

**COLORADO**
DENVER—Braun-Knecht-Heimann Company (C M)
DENVER—Chemical Sales Company (C M P T)
DENVER—McKesson & Robbins, Inc. (C M P T)
DENVER—Mine and Smelter Supply Company (C M P T)
GRAND JUNCTION—C. D. Smith Co., Chemical Div. (C P T)

**CONNECTICUT**
NEW HAVEN—H. Krevit and Company, Inc. (P T)
SHELTON—Axton-Cross Company (C M P T)
SOUTH NORWALK—McKesson and Robbins, Inc. (C M P T)
SOUTH NORWALK—Guard-All Chemical Company (P T)

**FLORIDA**
JACKSONVILLE—F. H. Ross and Company (C M P T)
JACKSONVILLE—Amica Burnett Chemical Co. (C M P T)
MIAMI—Amica Burnett Chemical Company (C M P T)
MIAMI—Biscayne Chemical Laboratories (C M P T)
ORLANDO—Atlantic Chemicals, Inc. (C M P T)
TAMPA—Atlantic Chemicals, Inc. (C M P T)

**GEORGIA**
ATLANTA—Chapman Chemical Company (T)
ATLANTA—McKesson and Robbins, Inc. (C M P T)
ATLANTA—F. H. Ross and Company (C M P T)
ATLANTA—Southern States Chemical Company (C M P T)
BIRMINGHAM—Chapman Chemical Company (T)
COLUMBUS—F. H. Ross and Company (C M T)
DUBLIN—Textile Aniline Chemical Company (T)

**IDAHO**
BOISE—Van Waters and Rogers, Inc. (C M P)

**ILLINOIS**
AURORA—River Valley Chemicals Inc. (C M P T)
CHICAGO—Central Solvents and Chemicals (C M P)
CHICAGO—C. P. Hall Company (C M P T)
CHICAGO—Keystone Aniline and Chemical Co. (C P)
CHICAGO—McKesson & Robbins, Inc. (C M P T)
CHICAGO—Joseph Turner and Company (C M P T)
DECATUR—McKesson & Robbins, Inc. (C M P T)
EFFINGHAM—Wabash Independent Oil Company (C P T)
PEORIA—McKesson & Robbins, Inc. (C M P T)
ROCKFORD—Industrial Oil and Chemical Company (C)
ROCKFORD—Viking Chemical Company (C M P T)

**INDIANA**
EVANSVILLE—Charles Leich and Company (P)
FT. WAYNE—Hoosier Solvents and Chemicals (C M P)
FT. WAYNE—Inland Chemical Corporation (C M P)
HAMMOND—Inland Chemical Corporation (C M P T)
INDIANAPOLIS—Hoosier Solvents and Chemicals (C M P)
INDIANAPOLIS—Wm. Lynn Chemical Company (C M P)
INDIANAPOLIS—Lynn Solvents Corporation (T)
INDIANAPOLIS—Ulrich Chemical Company, Inc. (T)
KOKOMO—Plating Products, Inc. (P T)
LOGANSPORT—Plating Products, Inc. (P T)
SOUTH BEND—Inland Chemical Corporation (C M P T)
SOUTH BEND—Stevens Oil Company (C M P)

**IOWA**
BETTENDORF—Barton Naptha Corporation (C M P T)
BURLINGTON—McKesson and Robbins, Inc. (C M P T)
CEDAR RAPIDS—McKesson and Robbins, Inc. (C M P T)
COUNCIL BLUFFS—Barton Solvents, Inc. (C M P T)
DAVENPORT—McKesson & Robbins, Inc. (C M T)
DES MOINES—Barton Naptha Company (C M P T)
SIOUX CITY—McKesson and Robbins, Inc. (P)
SUMNER—Overton Chemical Sales (C)

**KANSAS**
WICHITA—Barada and Page, Inc. (C M)
WICHITA—Reid Supply Company (C P T)

**KENTUCKY**
LOUISVILLE—Dixie Solvents and Chemicals (C M P)
LOUISVILLE—Gans Chemical and Supply Company (P)
LOUISVILLE—McKesson and Robbins, Inc. (C M P T)

**LOUISIANA**
BATON ROUGE—Barada & Page, Inc. (C)
LAKE CHARLES—Barada and Page, Inc. (C M)
NEW ORLEANS—Barada & Page, Inc. (C)
NEW ORLEANS—Southern Solvents and Chemicals (C M P T)

**MAINE**
LEWISTON—Polar Chemical Company (C M P T)

**MARYLAND**
BALTIMORE—B. J. Howard Company (C M P T)
BALTIMORE—Leidy Chemicals Corporation (C M P)
BALTIMORE—Seiler Chemicals (C)
BALTIMORE—Tilley Chemical Company (T)

**MASSACHUSETTS**
BOSTON—Howe and French, Inc. (C M)
BOSTON—Linder and Company, Inc. (C M P T)
BOSTON—McKesson and Robbins, Inc. (C M P T)
EVERETT—Sessions-Gifford Co., Inc. (C M P T)
FRAMINGHAM—Axton-Cross Corp. of Mass. (C P T)
HINGHAM—Stephen-Roger, Incorporated (C M P T)
HOLYOKE—Eastern Chemicals, Inc. (M)
SPRINGFIELD—Chemical Corporation (C M P T)
SPRINGFIELD—Hampden Color and Chemical Co. (C M P)
STONEHAM—George Mann & Co. (C M P T)
WORCESTER—George H. Clark and Co. (C M P T)

**MICHIGAN**
DETROIT—Eaton Chemical and Dyestuff (C M)
DETROIT—Manpro Corporation (C M P T)
DETROIT—McKesson and Robbins, Inc. (C M P T)
DETROIT—Western Solvents and Chemicals (C M P)
DETROIT—Whitfield Chemical Company (P)
EAST DETROIT—Sherwood Chemical Company (P)
ESCANABA—Haviland Products Company (C M P)
FERNDALE—Manpro Corporation (C M P T)
GRAND RAPIDS—P. B. Gast and Sons Company (C)
GRAND RAPIDS—Haviland Products Company (C M)
GRAND RAPIDS—Wolverine Solvents and Chemicals Co. (C M P)
LANSING—Carrier Stephens Company (C P)
LANSING—Wheaton Chemical Company (C P T)
LUDINGTON—P. B. Gast and Sons Company (C)

**MINNESOTA**
MINNEAPOLIS—W. H. Barber Company (P T)
MINNEAPOLIS—McKesson and Robbins, Inc. (C M P T)
MINNEAPOLIS—Tripoli Refining Corporation (M P T)
ST. PAUL—Lyons Chemicals, Inc. (C M P)

**MISSISSIPPI**
JACKSON—F. H. Ross and Company (C M P)

**MISSOURI**
KANSAS CITY—Barada and Page, Inc. (C M)
KANSAS CITY—Missouri Solvents and Chemicals (C M P)
KANSAS CITY—Sherwood and Company, Inc. (C M P T)
ST. LOUIS—Barada and Page, Inc. (C M)
ST. LOUIS—Independent Oil Company (C M P T)
ST. LOUIS—McKesson and Robbins, Inc. (C M P T)
ST. LOUIS—G. S. Robins and Company (C M P)
ST. LOUIS—St. Louis Solvents and Chemicals (C P T)
ST. LOUIS—Missouri Solvents and Chemicals (C M P)

**NEBRASKA**
OMAHA—Barton Solvents, Inc. (C M P T)
OMAHA—McKesson and Robbins, Inc. (C M P T)

**NEW JERSEY**
BLOOMFIELD—McKesson & Robbins, Inc. (C M P T)
CAMDEN—Callahan Chemical Company (M P T)
EAST PATERSON—Aetna Color and Chemical Company (C M P T)
MURRAY HILL—American Mineral Spirits (C M P T)
NEWARK—American Oil and Supply (C P)
NEWARK—National Oil and Supply Company (C M P T)
PALISADE PARK—Philip A. Hunt Company (C)
VINELAND—Lirio Chemical Company (C T)

**NEW MEXICO**
ALBUQUERQUE—Braun Chemical Company (C M P T)
ALBUQUERQUE—Edmunds Chemical Company (C M P T)

**NEW YORK**
ALBANY—Eastern Chemical (C M P)
ATHENS—Spick Products Company (P T)
BINGHAMTON—Collier Chem. (C M)
BRONX—Elco Solvents Corporation (M P T)
BROOKLYN—Enequist Chemical Company (C P)
BUFFALO—Buffalo Solvents and Chemicals (C M P)
BUFFALO—Chemical Sales Corporation (C M P T)
BUFFALO—McKesson and Robbins, Inc. (C M P T)
EDGEMERE—Hogan Industrial Supply (P T)
GLOVERSVILLE—Eastern Chemicals, S. H. Ireland Div. (C M)
KEARNY—American Chemicals, Incorporated (C M P T)
LONG ISLAND CITY—Peerless Oil and Chemical (C M P T)
NEW YORK—American Chemicals, Inc. (C M P T)
NEW YORK—McKesson and Robbins, Inc. (C M P T)
POUGHKEEPSIE—Duso Chemical Company (C)
RENSSELAER—Eastern Chemicals, Inc. (C M)
ROCHESTER—Chemical Sales Corporation (C M P T)
SYRACUSE—Eastern Chemicals, Inc. (C M)
UTICA—Monarch Laboratories (C M P)

**NORTH CAROLINA**
CHARLOTTE—F. H. Ross and Company, Inc. (C M P T)
CHARLOTTE—Moreland Chemical Company (C M P T)
CHARLOTTE—Southern States Chemical Co. (C M P T)
GREENSBORO—F. H. Ross and Company, Inc. (C M P T)

**OHIO**
AKRON—Farley Solvents Company (C M P T)
AKRON—C. P. Hall Company (C P T)
CANTON—Bison Corporation (C P)
CINCINNATI—Amsco Solvents and Chemicals (C M P)
CINCINNATI—Chipman Supply Company (T)
CINCINNATI—Herbert Chemical Company (P T)
CINCINNATI—McKesson and Robbins, Inc. (C M P T)
CLEVELAND—Man-Gill Chemical Company (C P T)
CLEVELAND—McKesson and Robbins, Inc. (C M P T)
CLEVELAND—National Solvents Corporation (C P T)
CLEVELAND—Ohio Solvents and Chemicals, Inc. (C M P)
CLEVELAND—R. W. Renton Company (C P T)
COLUMBUS—McKesson and Robbins, Inc. (C M P T)
DAYTON—Industrial Chemical Products Co. (C P T)
DAYTON—Ottoson Solvents, Inc. (T)
LIMA—Thomson Chemical Company (C P T)
TOLEDO—Inland Chemical Co. (C M P)
TOLEDO—Toledo Solvents and Chemicals (C M P)
TOLEDO—M. I. Wilcox Company (C P T)
YOUNGSTOWN—Rhiel Supply Company (C M P T)

**OKLAHOMA**
OKLAHOMA CITY—Barada and Page, Inc. (C M)
TULSA—Barada and Page, Inc. (C M)
TULSA—Chemical Products, Inc. (C M P T)

**OREGON**
PORTLAND—Van Waters and Rogers (C M P)

**PENNSYLVANIA**
CONSHOHOCKEN—American Mineral Spirits (C M P T)
EASTON—Lehigh Valley Chemical Company (C M P T)
ERIE—Monarch Laboratories (T)
McKEES ROCK—Apex Soap and Sanitary Corp. (C P T)
PHILADELPHIA—Alex C. Fergusson Company (C P T)
PHILADELPHIA—McKesson and Robbins, Inc. (C M P T)
PHILADELPHIA—Phillips and Jacobs, Inc. (C M)
PHILADELPHIA—Pioneer Salt Company (C M P T)
PHILADELPHIA—George Senn, Inc. (C M P T)
PITTSBURGH—Carmac Chemical Company, Inc. (C P)
PITTSBURGH—Carman-Pittsburgh Company (C P T)
PITTSBURGH—Dacar Chemical Products Company (C P T)
PITTSBURGH—Ft. Pitt Chemical Company (C M P)
PITTSBURGH—McKesson and Robbins, Inc. (C M P T)
READING—R. W. Eaken, Inc. (C P T)
READING—Textile Chemical Company (C P)
SCRANTON—Scranton Chemical Company (C P T)
YORK—Industrial Solvents and Chemicals (C P T)

**RHODE ISLAND**
PROVIDENCE—George Mann and Company (C M P T)
PROVIDENCE—Sessions-Gifford Company, Inc. (C M P T)

**SOUTH CAROLINA**
CHARLESTON—Burris Chemical Company (C P T)
GREENVILLE—F. H. Ross & Company (C M P T)
GREENVILLE—Southern States Chemical Co. (C M P T)
SPARTANBURG—Moreland Chemical Company, Inc. (C M P T)

**TENNESSEE**
CHATTANOOGA—Chapman Chemical Co. (C M P T)
CHATTANOOGA—Wilson Sales Company (C M P T)
KINGSPORT—Chem-I-Dent, Inc. (C P T)
MEMPHIS—Chapman Chemical Company (C M P T)
MEMPHIS—C. P. Hall Company (C M P T)
MEMPHIS—Ideal Chemical and Supply Co. (C M P T)
NASHVILLE—Chapman Chemical Company (C M P T)
NASHVILLE—Wilson Sales Company (C M P T)

**TEXAS**
AMARILLO—State Chemical Company (C M P T)
AUSTIN—R. M. Hughes Company, Inc. (C M P T)
BEAUMONT—Arthur Dooley and Son (C M P T)
CORPUS CHRISTI—Barada and Page, Inc. (C M)
DALLAS—Barada and Page, Inc. (C M)
DALLAS—McKesson & Robbins, Inc. (C M P T)
DALLAS—Texas Solvents and Chemicals Co. (C)
DALLAS—Van Waters and Rogers, Inc. (C M P T)
EL PASO—Baron Chemical Company (C M P T)
EL PASO—Braun Chemical Company (C M P T)
EL PASO—Mine and Smelter Supply Company (P)
FORT WORTH—Barada and Page, Inc. (C M)
FORT WORTH—Worth Chemical Products Co. (C M P)
HOUSTON—Barada and Page, Inc. (C M)
HOUSTON—W. H. Curtain and Company (P)
HOUSTON—Dixie Chemical Company (C M P T)
HOUSTON—R. M. Hughes Company, Inc. (C M P T)
HOUSTON—McKesson, Texas Chemical Division (C M P T)
HOUSTON—Texas Solvents and Chemicals Co. (C M P)
HOUSTON—Van Waters and Rogers, Inc. (C M P T)
LUBBOCK—State Chemical Company (C M P T)
MIDLAND—State Chemical Company (C M P T)
ODESSA—Barada and Page, Inc. (C M)
SAN ANTONIO—R. M. Hughes Company, Inc. (C M P T)
SAN ANTONIO—McKesson and Robbins, Inc. (C M P T)

**UTAH**
SALT LAKE CITY—Braun-Knecht-Heimann Co. (C M P T)

**VIRGINIA**
NORFOLK—Taylor Salt and Chemical Company (C P T)
RICHMOND—Phipps and Bird, Inc. (C M P)
ROANOKE—Havnaer Supply Company (C M P T)

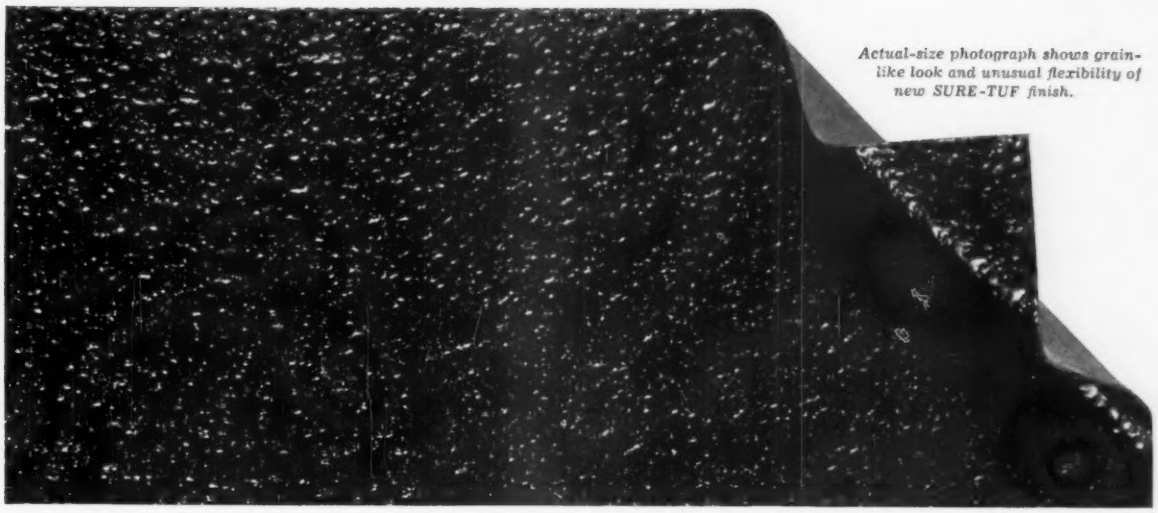
**WASHINGTON**
SEATTLE—Van Waters and Rogers, Inc. (C M P)
SPOKANE—Van Waters and Rogers, Inc. (C M P)

**WEST VIRGINIA**
CHARLESTON—B. Preiser and Company (C M P T)
FAIRMONT—Fairmont Machinery, Fairmont Supply (C P T)
HUNTINGTON—Cabell Chemical Company (C P T)

**WISCONSIN**
CHIPPEWA FALLS—Lyons Chemical (C M P T)
LA CROSSE—North Central Chemical, Inc. (M P T)
LA CROSSE—Wisconsin Solvents & Chemicals Corp. (C M P)
MADISON—North Central Chemicals (C M P T)
MILWAUKEE—McKesson and Robbins, Inc. (C M P T)
MILWAUKEE—Wisconsin Solvents and Chemicals (C M P)
WAUKESHA—Fred Portz and Son (C T)

## See Your Distributor of Dow Solvents First!

# Looks like leather!
# Wears like iron!



*Actual-size photograph shows grain-like look and unusual flexibility of new SURE-TUF finish.*

## Amazing New LOWE BROTHERS SURE-TUF™ finish

***...bakes on, dries tough, won't crack, gives metal products a "new look" that builds sales***

The close-up photograph here only gives you a hint of how new Lowe Brothers SURE-TUF really looks. You need actual samples of black and colors to judge the rich appearance, the "leather-grain" depth, the unusual durability and bendability of this easy-to-work baked-on enamel finish. Write today. Tell us to rush samples with information—or to send a Lowe Brothers finishing engineer to visit you for a first-hand discussion of how SURE-TUF can improve your metal products.

**LOWE BROTHERS**
**INDUSTRIAL FINISHES**

QUALITY UNSURPASSED SINCE 1870

*Style-tested paints for Home and Industry*

**REPRESENTATIVES IN:**
Chicago, Ill. • Boston, Mass.
Jersey City, N. J. • Cleveland, Ohio
Pittsburgh, Pa. • Rochester, N. Y.
Dayton, Ohio • Columbus, Ohio
Milwaukee, Wis. • Indianapolis, Ind.
Cincinnati, Ohio • Detroit, Mich.
Springfield, Mass. • Philadelphia, Pa.

**The Lowe Brothers Company** MF-8-59
**Dayton 2, Ohio**

☐ Please have my nearest Lowe Brothers Finishing Engineer call on me as soon as possible.

NAME_____

TITLE_____

FIRM NAME_____

ADDRESS_____

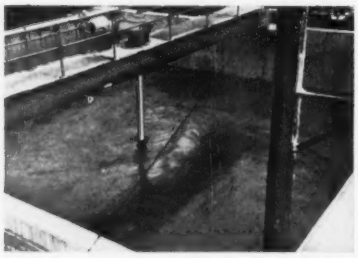
CITY_____ ZONE____ STATE_____

# FOR CHEMICAL AND WATER RECOVERY AND POLLUTION ABATEMENT...

## choose the waste treating equipment you need from the complete INFILCO line

EMINENCE IN EQUIPMENT DESIGN · INFILCO · GIVES YOU PLUS VALUES ·

SEE YOUR CONSULTING ENGINEER
if you are planning *any* major installation.
His services can be invaluable in designing your plant and helping you select the equipment that best meets your requirements.



**VORTI**® Mixers provide the advantages of low power consumption and no underwater bearings for effective mixing, floc formation, and equalization. Designed for rectangular, square or round basins.

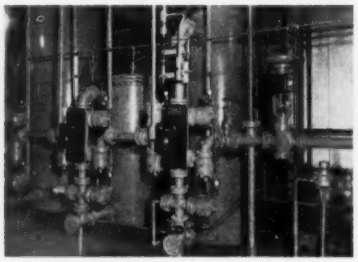
**Bulletin 730-5430**

**Dry Feeders**... Type E provide automatic proportional or constant rate feeding for lime, alum and many other dry materials. The feeder with linear feed adjustment throughout capacity range of feeder; can be furnished with counter to totalize volume of feed.

**Bulletin 215-E**

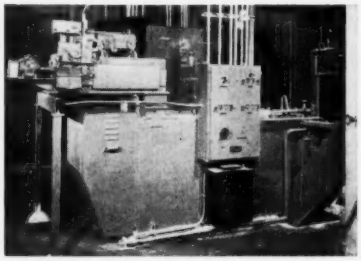
**CYCLATOR**® Clarifiers for clarification, precipitation and removal of toxic metals. Combines mixing, reaction, controlled slurry recirculation and solids separation in a single unit, with hydraulically operated skimmers when needed. Provides the highest degree of treatment in addition to saving space and cutting installation costs.

**Bulletin 850-C**



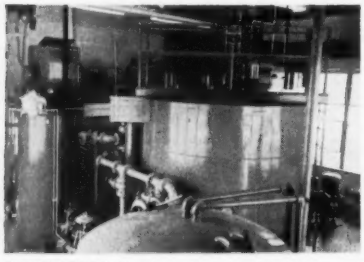
**CATEXER ANEXER**® Ion Exchangers for the recovery of chemicals and rinse water, and the purification of chromic acid as well as for softening or demineralizing process water. Pressure or gravity exchangers available for manual, semi-automatic or automatic operation.

**Bulletin 1960-C**



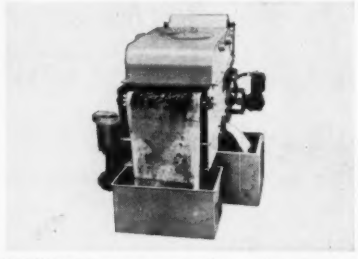
**VISCOMATIC**® Slaker hydrates lime completely with cold water. Water and quicklime are combined as a paste with true pug mill action. Torque control maintains constant viscosity assuring proper slaking with very little attention. Automatic grit washing and removal provides maximum lime recovery.

**Bulletin 255-A**



**SEDIFLOTOR**® Clarifier combines flotation and sedimentation in one compact unit. Particularly effective for the treatment of wastes containing greases, oils and light suspended solids. Provides maximum capacity in locations where space is limited.

**Bulletin 6051**



**IMPINJO**® Filter cuts production costs and saves money on any metal-working operation using coolants or cutting oils. Removes metallic and non-metallic solids. Reduces rejects, lengthens tool, wheel or abrasive belt life, saves coolant and minimizes waste disposal problems.

**Bulletin 9020-A**

INFILCO

941

**INFILCO INC.**

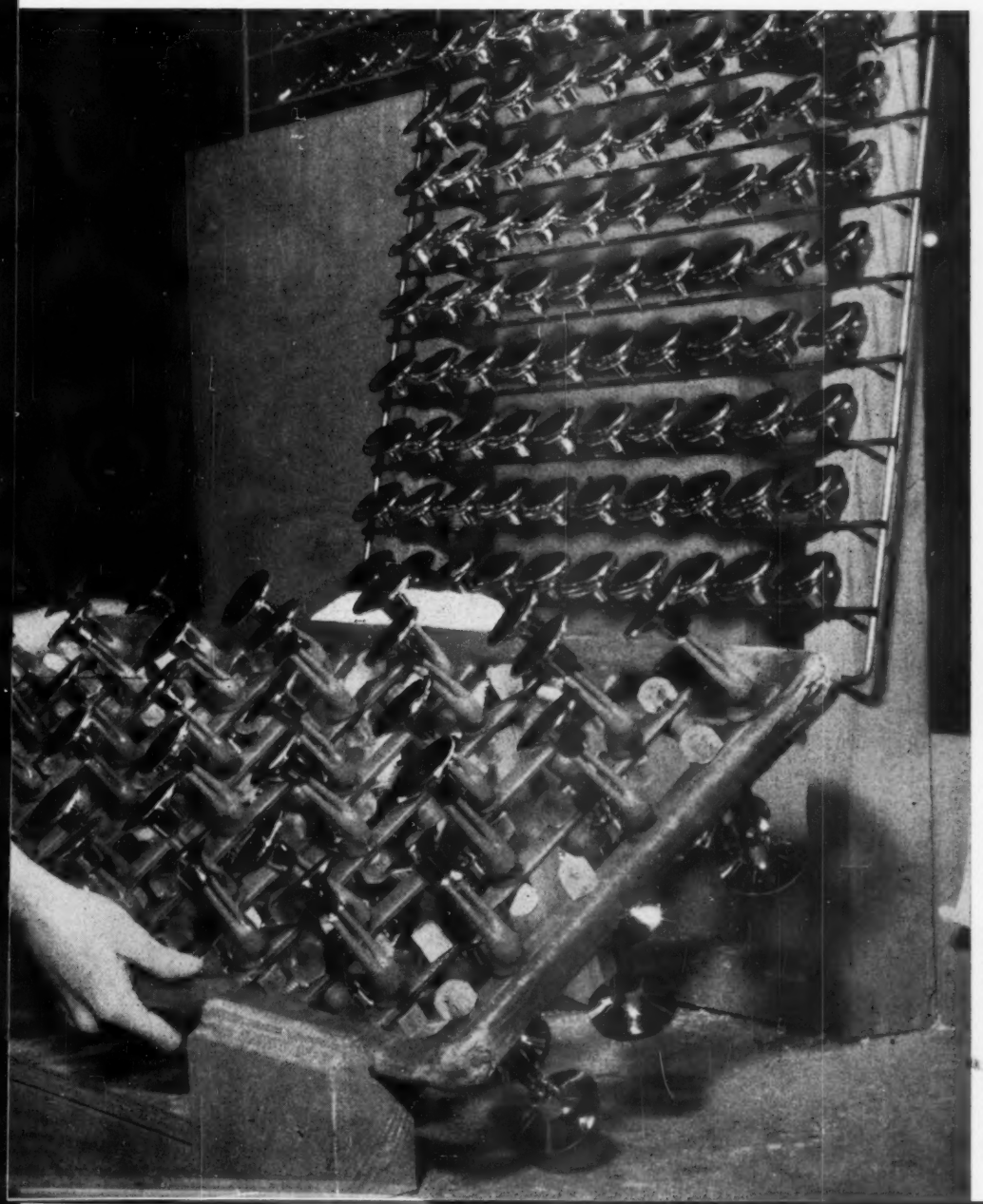
**General Offices: Tucson, Arizona**

Field offices throughout the United States and in other countries

INFILCO can help you and your engineer evaluate any metal finishing waste or other industrial waste disposal problem.
Write today for Bulletin 80-A for a complete listing of INFILCO equipment.

***Unique new brightener for zinc and cadmium plated parts*** has been developed by Federated: CONMAX, a conversion coating for plated finishes from brilliant to iridescent, provides corrosion resistant film to zinc and cadmium plate. Other high quality, low-cost brighteners from Federated: ZIMAX for all types of zinc plating, still, automatic, and barrel; CADMAX for cadmium plating; NIMAX, highly concentrated brightener for nickel barrel plating. These brighteners undergo rigid competitive tests before approval for sale. This also applies to Federated's complete line of plating anodes and nickel salts. It's safest when you specify plating supplies from Federated Metals Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. In Canada, Federated Metals Canada, Ltd., Toronto and Montreal.

**FEDERATED METALS DIVISION OF**



**ASARCO**

AMERICAN SMELTING AND REFINING COMPANY

**News about COATINGS FOR METALS**

*from Metal & Thermit Corporation*

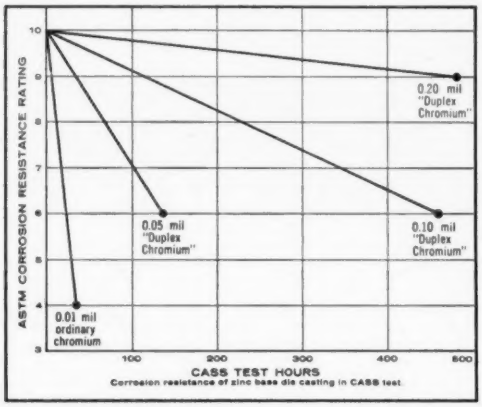
# How to get the optimum protection of bright chromium plating

There are three requisites to increasing corrosion protection from chromium plating. (1) The deposit must be sufficiently thick. (2) There should be a crack-free chromium base topped by a special, finely cracked chromium deposit. (3) The plate should be more uniformly distributed over the part, so that recessed areas, too, are assured at least 0.03 mils minimum chromium thickness.

All of these requirements are easily met through UNICHROME SRHS® CHROMIUM plating processes. Work done for the automotive industry, long plagued by corrosion of brightwork in outdoors exposure, provides a good case in point.

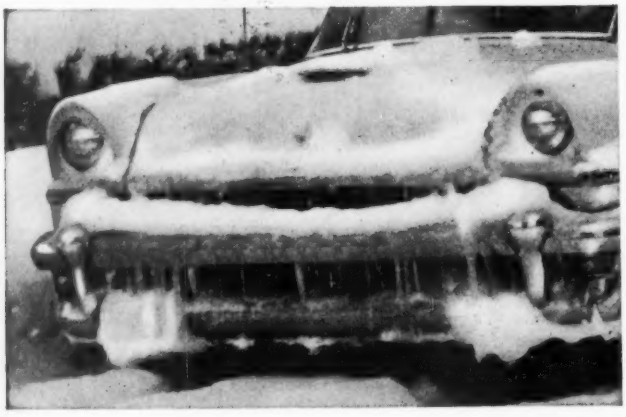
**AN ANSWER TO OUTDOOR CORROSION**

Note the results in the chart at right. In all cases, the thickness of undercoats was kept constant. Only the chromium plate was varied... from ordinary to "Duplex", and progressively thicker. M&T "Duplex Chromium" calls for first using Unichrome Crack-Free Chromium and its ability to throw into recesses and give a more uniform and fracture-free plate. This is followed by another deposit of Unichrome SRHS Chromium, with its *controlled* cracking. With increasing thickness, the protection increased tremendously. Durability as determined by rigorous, accelerated corrosion testing techniques was multiplied as much as *20 times.*




Zinc die cast specimens, all plated with 0.75 mil copper and 0.75 mil nickel prior to chromium lasted as shown above in the severe CASS test (Copper accelerated acetic acid salt spray). Ordinary chromium fared poorly. Optimum protection was approached by using Crack-Free Chromium and increasing the deposit thickness.

Despite severe service conditions, automotive brightwork can stay bright now, due to the additional corrosion protection that M&T "Duplex Chromium" provides.



**WIDELY USEFUL FINISH**

While the above case concerns itself specifically with an automotive problem, it indicates what thicker chromium in general, and crack-free chromium in particular can do for other design problems involving corrosion and wear. This plate blocks infiltration of corrosives to underlying metal.

Technical Papers giving full details on the advantages of thicker chromium deposits are available for the asking. Write METAL & THERMIT CORPORATION, Rahway, New Jersey.

**METAL & THERMIT**
**CORPORATION**

# *FOUNDATION makes the difference!*

**INTERLOX**
**assures a sound base for your finish.**

The Interlox line was developed by Northwest's Cleaning Specialists to give you a better, lower cost, easily controlled phosphate base for organic finishes.

Interlox iron phosphate products deposit a high quality, fine grained, dense coating with great speed and dependability.

There is an Interlox product developed to meet your particular need whether spray or immersion type, single or multiple stage. Interlox baths are unusually long lived and require less additions and control.

Northwest's production-tested chemicals and dependable recommendations will save you money. Your Northwest Cleaning Specialist can give you expert advice on any cleaning or phosphatizing problem.

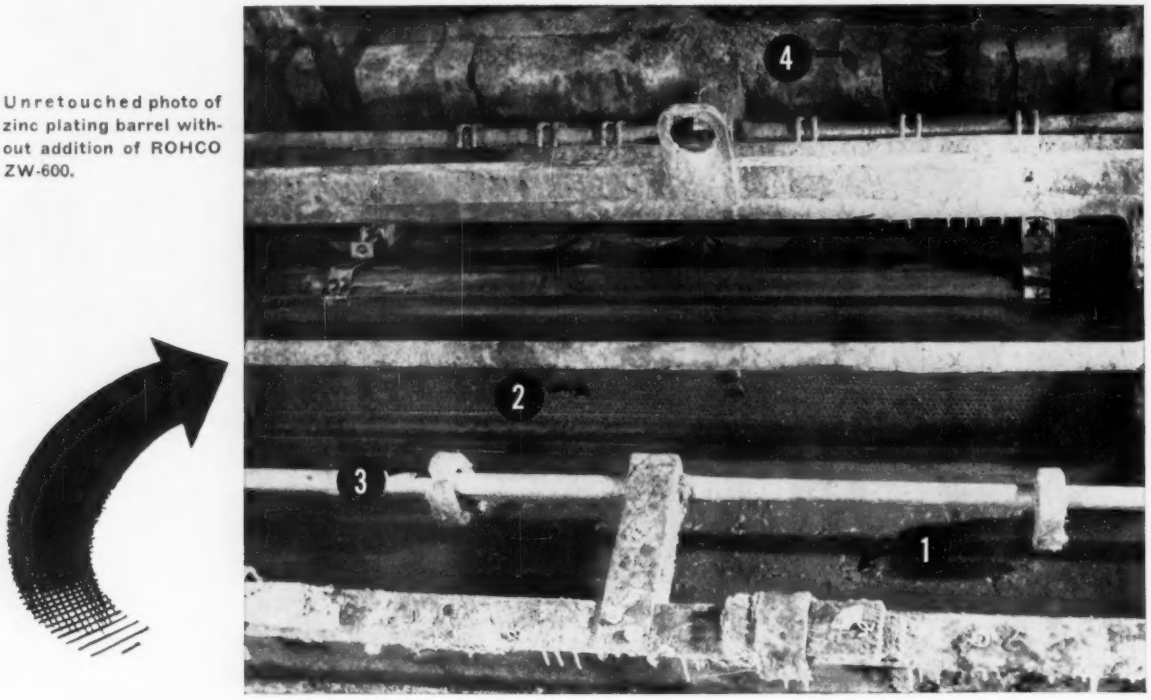
*Licensed Manufacturers*

**Alert Supply Co. Los Angeles, California  Armalite Company, Ltd. Toronto, Canada**

**NORTHWEST CHEMICAL COMPANY**
**9310 ROSELAWN  DETROIT 4, MICHIGAN**

# Do Your Zinc Barrels **LOOK** Like This?

Unretouched photo of zinc plating barrel without addition of ROHCO ZW-600.




1. Does the surface of the zinc plating solution become covered with grease and sludge?
2. Do the holes in the barrel plug up?
3. Do you lose electrical contact between the anode baskets and rods?
4. Do tank rims become encrusted with salts — look unsightly and cause electrical shorts?

## ROHCO® ZW-600 WILL PREVENT THESE CONDITIONS!

**ZW-600 — a newly developed wetting agent for use in zinc plating baths gives better rinsing and usually will pay for itself by reducing dragout.**

*Ask your ROHCO Representative for trial sample, today!*

ROHCO

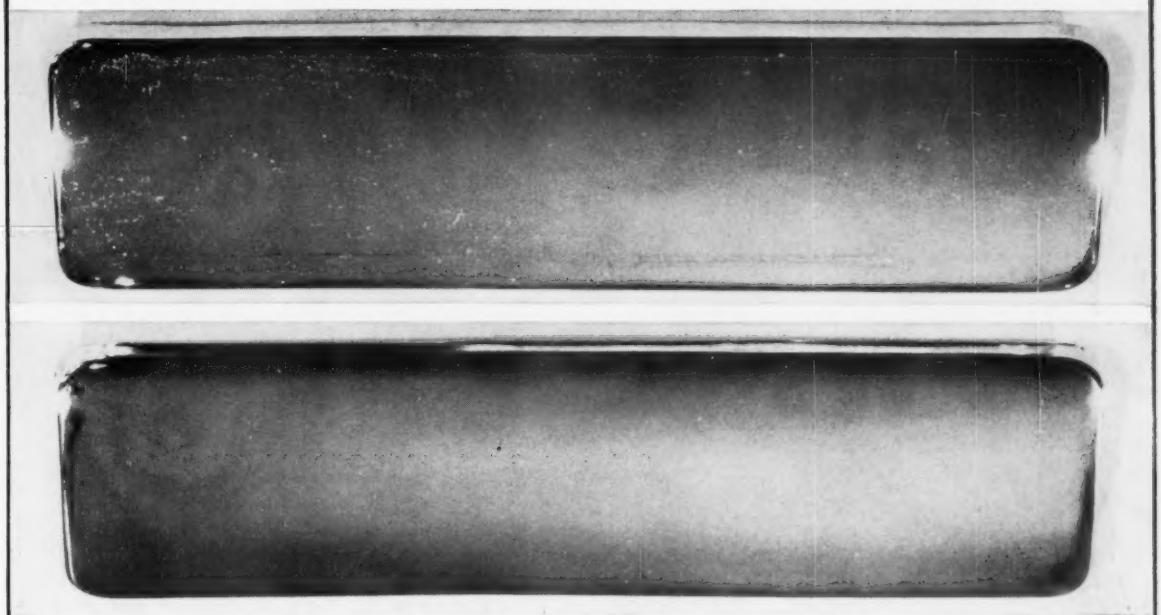
Nationwide Stockpoints

**R. O. HULL & COMPANY, INC.**

**1301 Parsons Court Rocky River 16, Ohio**

THE RIGHT START . . . A BETTER FINISH

# The Difference is *Soak Cleaning!*



These unretouched photos show plated zinc die-cast bars. *Top Photo:* Plating defects are visible on a bar precleaned with a conventional soak cleaner. *Bottom Photo:* Note the bright, lustrous, defect-free plate of the bar precleaned with Kelite SUPERSOLV as the soak cleaner.

## For *bright, defect-free* die-cast plate . . .

Use Kelite SUPERSOLV as the Soak Cleaner prior to electrocleaning.

## • What SUPERSOLV* is . . .

SUPERSOLV is a non-etch, non-passivating alkaline soak cleaner for zinc-base die-cast parts.

## • What SUPERSOLV* does . . .

Used at a concentration of 5 oz./gal. at 160° to 170° F., SUPERSOLV removes mineral oils, buffing compositions and shop soils in a 1 to 2-minute soak cycle without sensitizing or staining the parts, or making them subject to roughness after electrocleaning and acid dip. The result is defect-free plate of improved brightness and lustre.

**WRITE FOR PROCESS DETAILS ABOUT A TYPICAL ZINC-BASE DIE-CAST CLEANING CYCLE USING SUPERSOLV**

*Patented, U. S. Patent Office

KELITE®

**KELITE CORPORATION**

LOS ANGELES 12 • CHICAGO 45 • BERKELEY HEIGHTS, N. J.

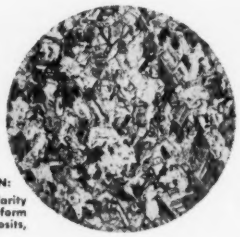
# for mirror-bright gold and rhodium plating

**ATOMEX®** is a 24k gold immersion solution that permits the deposition of a thin, dense, uniform layer of 24k gold on such items as trophies, costume jewelry, lamp components, clock assemblies, photograph frames, bottle caps, radio knobs, metallized plastics and many other objects, by means of a simple bath. The Atomex procedure is more permanent and less expensive than electroplating of comparable thickness. Costly analytical control is unnecessary.

**RHODIUM** Plating Solution . . . is ideal for putting a decorative finish on many types of jewelry. It has a hard, brilliant white, non-tarnishable, highly reflective surface and is extremely resistant to corrosion. It gives greater sales appeal to any jewelry on which it is used. A complete line of Rhodium plating solution are available.

CHEMICAL DIVISION • 113 ASTOR STREET
NEWARK, N. J.

**ROLLED FLAT PLATE ANODE SECTION:** This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.



**EXTRUDED ANODE SECTION:** Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

# these anodes are extruded and shaped to lower plating costs

These scientifically shaped anodes retain 80% of original active surface area after 85% by weight has been plated off!

Costs are lowered by prolonged anode life, minimized polarization and less silver scrap to be refined. In addition, the AP & S Extrusion Process controls grain size within definite ideal limits so that corrosion is smooth and uniform. Electro-deposits are consistently smooth. Shedding is virtually eliminated. Rejects are a comparative rarity!

We are anxious that the silver you buy in anodes is used most efficiently and economically. Special anode shapes will be engineered to meet your particular plating bath conditions. Call or write for a representative. We'll be glad to assist with your plating problems.

AMERICAN PLATINUM & SILVER DIVISION
231 N. J. RAILROAD AVENUE, NEWARK, N. J.

CHEMICAL DIVISION

ENGELHARD INDUSTRIES, INC.
EXECUTIVE OFFICES:
113 ASTOR STREET • NEWARK 2, NEW JERSEY

AMERICAN PLATINUM & SILVER DIVISION

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# HOW TO MAKE YOUR $'S DEGREASE MORE PARTS

You make no profit on the time you spend cleaning out a degreaser.

You cut another slice off the top of profits whenever you have to add fresh stabilizer to your trichlorethylene bath.

When a bath goes "sour" while you're processing, you lose still more time and money.

## psp is the simple answer

Trichlor is trichlor the world over; it's the *stabilizer* in your trichlor that can make the difference.

The difference in Nialk® stabilizer is *psp*—permanent staying power.

Nialk stabilizer is neutral. It cannot react with acids to form corrosive salts. Still it "accepts" acids and renders them completely harmless. The Nialk stabilizer will not stain or discolor your parts or allow your bath to become "sour."

You never add fresh stabilizer to a Nialk bath. The stabilizer stays potent no matter how long you use it. It's insoluble in water so you don't lose it during steam distillation or in the water separator of your degreaser.

Nialk frees your bath of those degradation products which settle on coils and cut down heat transfer. Clean-outs are widely spaced and quickly finished.

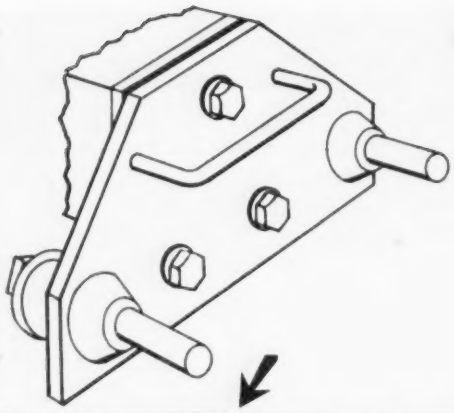
If your profit picture could use a little brightening, you'll want to know more about the whole subject of trichlor stabilizers. Send for our Bulletin 70 for the complete story.

**HOOKER CHEMICAL CORPORATION**
*1308 Union Street, Niagara Falls, N. Y.*

HOOKER CHEMICALS PLASTICS

NIALK® CHEMICALS
OLDBURY® CHEMICALS
SHEA® CHEMICALS
DUREZ® PLASTICS

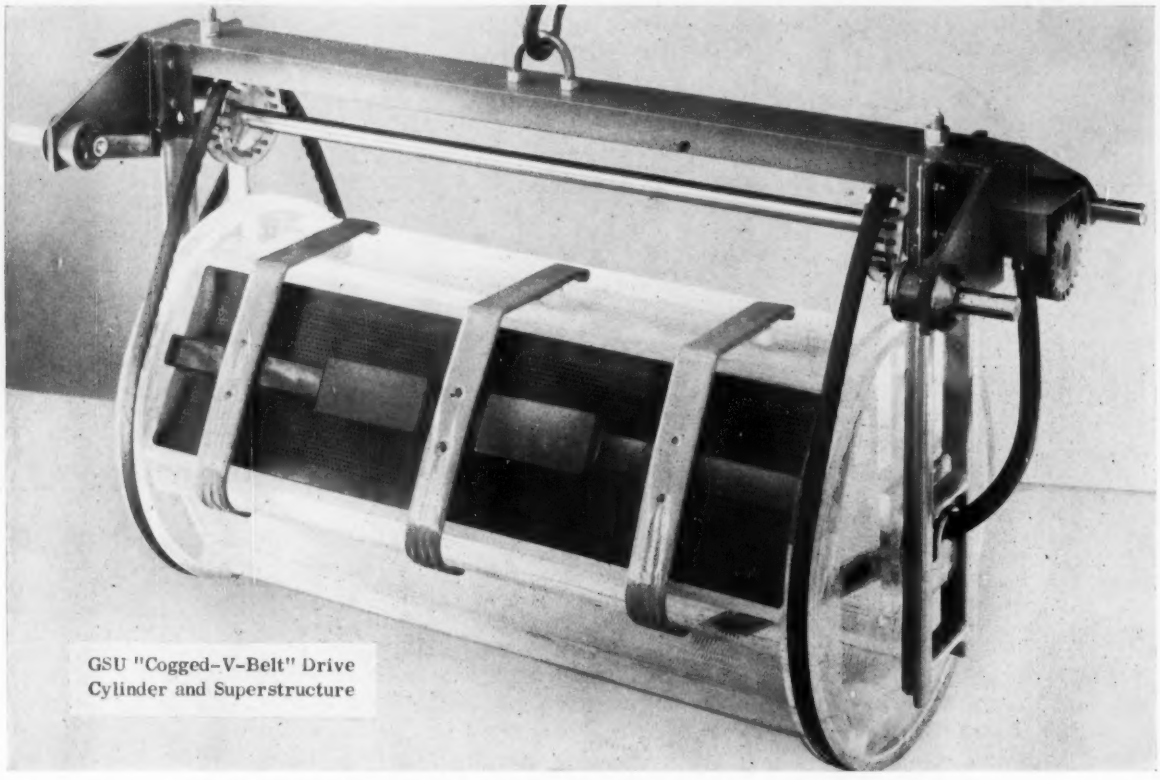
*Sales Offices:* Chicago, Ill.; Detroit, Mich.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C.



## *another exclusive reason why . . .*

# G-S means Greater Savings

**3-Point Suspension for 4-Point Horn Contacts** (patented) End plate with horn contacts, opposite from drive end, semi-floating for automatic 3-way corrective adjustments. 3-point suspension seats all 4 horns for positive contact. Can't rock. Prevents insulator-burning. Same principle as G-S Floating End Plates for constant contact of inverted V-Blocks. More positive contacts than on any other make of plating barrel.



GSU "Cogged-V-Belt" Drive Cylinder and Superstructure

**"The Belt-Drive with the Gear-Grip" Saves 100% Gear Maintenance.**
**Eliminates cylinder-end drive gear, idler gear, pinion gear, 3 bearings. No gears or bearings in solution.**

## G-S GIVES YOU MORE EXCLUSIVE FEATURES

★ **G-S Cogged V-Belt and Cogged Drive-Pulley.** (U.S. Pats. 2,562,084 and 2,886,-505), constant meshed for positive power transmission without gears. Can't slip, creep, vary speed. Cogged-V-Belts finest in the field; chemically resistant Neoprene with non-stretch tensile members, double Nylon protective envelope; cogged by special machinery exclusive with G-S. Self-lubricating Polydur cog-pins in Drive Pulley eliminate friction-wear. Outlast, outperform all others.

★ **Floating End Plate** (see above) Also for constant contact of inverted G-S V-blocks.

★ **Adjustable Bearings** support drive shaft — maintain constant-mesh with motor drives at all times.

★ **Floating Hubs** with danglers angled downward for constant cathodic contact in center of load. Won't "ride" up on top of load.

★ **Heavier Dangler Cables** for higher current carrying capacity, longer life, better operation.

★ **Faster Dangler Cleaning** — Patented hub-lock for fastest cylinder interchange.

★ **Rugged, All-Welded or All-Bolted Cylinders** — Components of "H-T Plexiglas," "Tempron", poly — any combination. Heavy-duty 2" ribs. No "formed" or "molded" sections. Longer life. Best for complete cycles, temps. to 200°F. New, Self-Adjusting Door Clamps, spring-looped at one end for constant tension; can't slip or loosen. New, "T" Door Handles for 2-handed grip; safer, easier handling. Welded on center, full-length, reinforcing door rib.

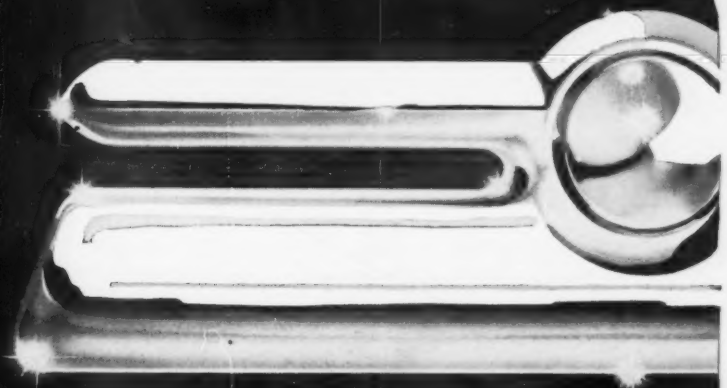
★ **Many More G-S Features** — Exclusive on G-S Plating Barrels: Inverted-V-Contacts (48" contact area), Automatic Positioning of superstructure, Total Cylinder Immersion, Single-Screw Adjustable Motor Mount on tank raises and lowers motor drive to mesh with superstructure gear, 3-Speed Drive Pulleys, etc.

Get all the facts! Investigate the new, low-cost G-S Conversion Plan for **your** plant. It pays for itself in maintenance savings alone. Write today.

## *The G. S. Equipment Co.*

**15583 Brookpark Rd., Cleveland 35, Ohio**
**CLearwater 2-4770**

# UNMATCHED CORROSION RESISTANCE



***The No. 1 Feature of***

**HARSHAW PERFLOW PERGLOW DUPLEX *Nickel Plating Process***

**Harshaw's research and development laboratory solved the problem of plating nickel on nickel. This, coupled with the use of a sulfur-free nickel plate and a bright nickel from a compatible bath, has made possible a Duplex deposit with unequalled corrosion resistance.**

***EXCELLENT CORROSION PROTECTION ACHIEVED THROUGH USE OF A SULFUR-FREE DEPOSIT***

The Harshaw Chemical Company after years of research and development work was the first to find that a *sulfur-free* nickel offers greater corrosion resistance. This fact led to the development of the Harshaw Perflow nickel plating process. Further research showed that use of the sulfur-free Perflow nickel deposit as a base coating, followed by a bright nickel deposit from a *compatible* bath, would give a Duplex deposit with a further improvement of corrosion resistance. Performance data, by both accelerated tests and outdoor exposure, from leading automobile manufacturers and parts suppliers indicate that the Harshaw Perflow-Perglow Duplex nickel plate is comparable to and frequently better than, buffed gray nickel and is unequalled by any bright nickel.

**MANY OTHER ADVANTAGES**

1. Exceptionally high plating speeds —with air or mechanical agitation.
2. Excellent Chrome Coverage.
3. Unsurpassed Leveling Characteristics.
4. Outstanding Brightness.
5. High Tolerance to Impurities.
6. Excellent Adhesion.
7. Excellent Ductility at Full Brightness.
8. Simplified Control — Stable over extended periods of operation.
9. Controlled Stress.
10. Uniform Protective and Decorative plate on both steel and zinc die castings.

**THE HARSHAW CHEMICAL CO.**

1945 EAST 97TH STREET • CLEVELAND 6, OHIO

Chicago • Cincinnati • Cleveland • Detroit • Houston
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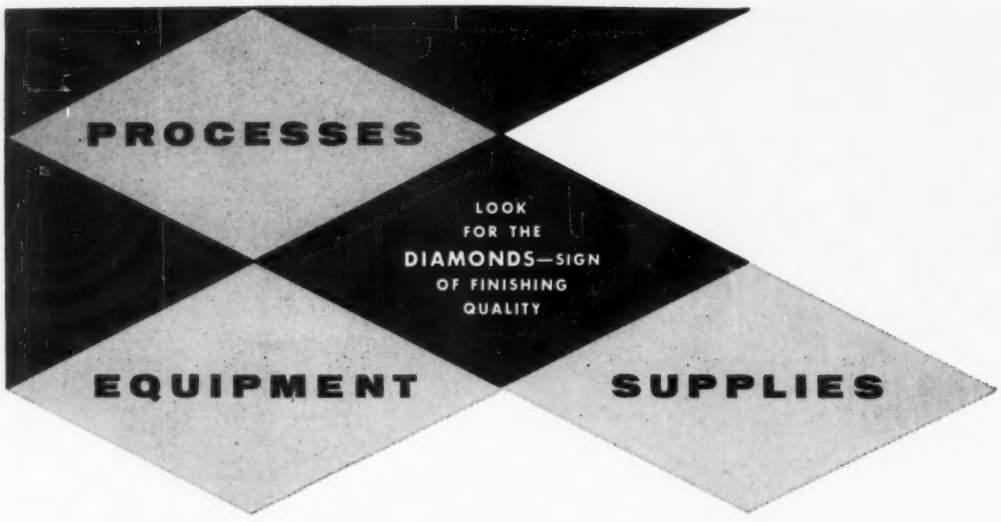
HARSHAW




# *Now—from Allied Research*

***—a new systems concept for the finishing of metals.***

# *Process Engineering Service*

***The first—and only—service built around the most important part of your operations . . . your process requirements.***

## Why a PROCESS Engineering Service?

Allied Research's long and broad experience in helping customers solve process and equipment problems of all types has led to one important conclusion:

*Only by integrating equipment with your particular process are you assured of getting these important benefits from your operations: (1) higher production, (2) greater efficiency, (3) lower operating costs, (4) consistent product quality.*

Our success in helping our many customers reach these important objectives has prompted us to offer this unique service to the entire metal finishing industry.

### *What does our Process Engineering Service consist of?*

**CONSULTATION**—Experienced representatives will assist you in properly planning any part of or all your process and equipment requirements.

**RECOMMENDATION**—Trained engineers will recommend the particular process, equipment and chemicals to provide you with the best in operating efficiency and economy for your specific production requirements.

**INSTALLATION**—Planned, engineered and supervised—including plumbing, electrical, ventilation and disposal requirements—or whatever else is needed to assure efficient and proper operations.

**SERVICE**—Field Engineers insure proper start-up and will make necessary maintenance recommendations. They are available for periodic check-up.

**"TURN-KEY" Service**—let Allied Research take complete responsibility for laying-out, designing, building, installing and servicing your complete process operations. *Open the door to your plant and start production.*

**Get the complete details on Process Engineering Service today. Call your Allied Field Engineer. He's listed under "Plating Supplies and Equipment" in the yellow pages. FREE TECHNICAL DATA FILES on Allied Research processes, equipment and chemicals sent on request.**

*Allied Research Products, Inc.*

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BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
*West Coast Licensee for Process Chemicals: L. H. Butcher Co.*

*Chemical and Electrochemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing*

IRIDITE® Chromate Coatings | IRILAC™ Clear Coatings | ISOBRITE® Plating Brighteners | ARP® Chemicals & Supplies | WAGNER Line of Equipment

Metal Finishers, Inc., uses Mutual Chromic Acid in its "Mecrome" plating of cylinder liners. Each liner is examined with a microscope (above). Micro-photograph shows uniformity of pockets which retain lubricating oil.

# Combine your plating skill with high quality Mutual Chromic Acid

## *For longer-lasting, more uniform chrome wearing surfaces . .*

Uniform porous chrome plating in cylinder liners can increase cylinder life up to five times. To get this uniformity requires plating skill *and*—high quality Mutual Chromic Acid.

Mutual Chromic Acid is always 99.75% pure—or better. Sulfate content never exceeds 0.1%, permitting closer control of the acid-sulfate ratio in the bath. This is one reason why many of the country's leading platers specify Mutual Chromic Acid.

A booklet, "Mutual Chromium Chemicals, offers information on chromic acid and other Mutual products. Just mail the coupon for your free copy.

Mutual chromium chemicals

**Sodium Bichromate**
**Sodium Chromate**
**Chromic Acid**
**Potassium Bichromate**
**Potassium Chromate**
**Ammonium Bichromate**
**Koreon (one-bath chrome tan)**

**SOLVAY PROCESS DIVISION**
61 Broadway, New York 6, N.Y.

Allied Chemical

**MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast.**

**Solvay Process Division**
Allied Chemical Corporation
61 Broadway, New York 6, N. Y.
Dept. 9-89

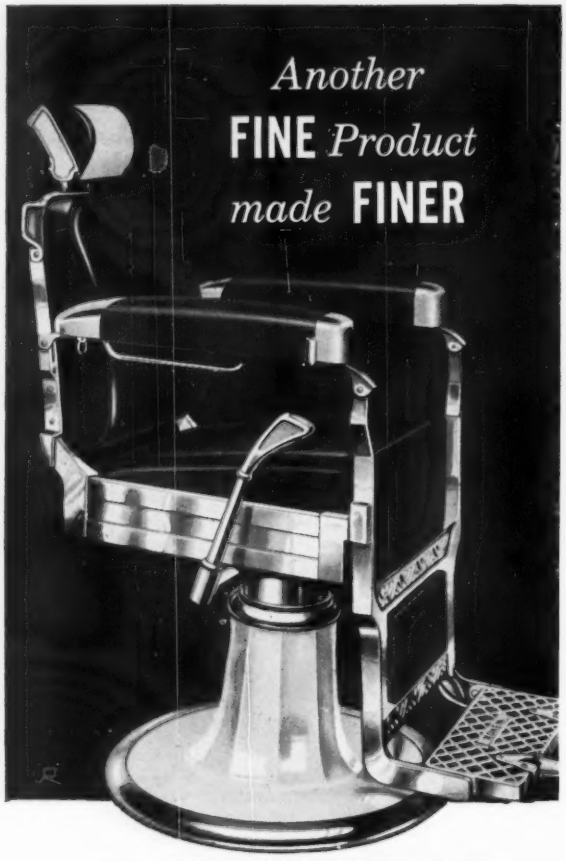
Please send me Bulletin #52—"Chromium Chemicals."

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____




with the PARAMOUNT
Finishing Touch

"A superior finish is essential on the castings for our chairs," says Koken Companies, Inc., St. Louis, leading manufacturer of barber chairs.

"For appearance they must be finished flat with no rounding of edges. We do it quickly and easily by using Paramount Felt Wheels and 150-220 oxide grit. Paramount Wheels are ideal because they hold the compound well, follow flat surfaces easily and produce a finish more quickly than any other wheels we have used."

Your products deserve the fine finish only Paramount Wheels can produce. Learn more about their advantages —

*call your Paramount Supplier today!*

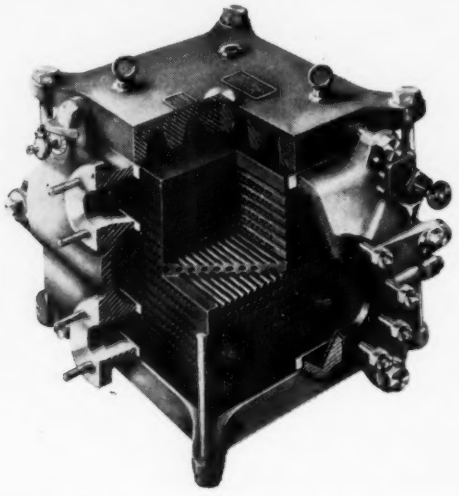
*Paramount*

Felt Wheels
Bobs, Sheet Felt

**Bacon Felt Co.**
437 West Water St., Taunton, Mass.

now... *Faster Heat-up of Plating Solutions*

**such as NICKEL SULFATE • NICKEL CHLORIDE • COPPER SULFATE COPPER FLUOBORATE • ACIDIC PICKLING SOLUTIONS**



# 'Delanium' Graphite BLOCK TYPE Heat Exchangers

**HERE'S AN EXAMPLE** of the efficiency you can expect from rugged, compact 'Delanium' Graphite Heat Exchangers: 4500 gallons of bright nickel plating bath can be brought from 60° F. to 140° F. in just *one hour* . . . using one Model 50/50 'Delanium' Exchanger with steam at 75 psi.

| | |
|---|---|
| Over-all Heat Transfer Coefficient | 330 BTU per hour/° F./ft.² |
| Log Mean Temperature Differential | 218° F. |
| Required Heat Transfer Area | 50 sq. ft. |

**(Can also be used to cool anodizing solutions.)**

**SIXTEEN MODELS** ranging from 4 sq. ft. to 350 sq. ft. of transfer surface in single graphite blocks (no fragile tubes) cover a wide range of plating applications. And 'Delanium' Graphite Heat Exchangers *can utilize steam to 100 psi.* There are no "floating heads," no packing, no gaskets between flow streams. Headers are easily removed for inspection and cleaning.

Write today for descriptive bulletin. Call on the Delanium technical staff for special applications on time- and money-saving 'Delanium' Graphite Heat Exchangers to your particular operations.

**KEARNEY INDUSTRIES**
**DELANIUM GRAPHITE DIVISION**
**P. O. BOX 501** **SOUTH PLAINFIELD, N. J.**

# ...reflection of quality

*A mirror-like finish is achieved on this toaster housing with Udylite "66"*

# THE INCOMPARABLE "66"

Udylite's Bright Nickel Process "66" is sweeping the country with new installations and conversions to provide a truly incomparable plate with almost unbelievable ease of operation. The color of the process alone, sells "66" in any comparison.

The production of your existing equipment can be *greatly increased* with the introduction of Process "66". Its outstanding qualities include exceptional levelling ability and remarkable ductility for so bright a finish.

In addition, Process "66" has overcome the problems previously considered inherent in plating over semi-bright nickel and, it is unusually receptive to chromium. You'll find that the amazing adaptability of this very bright finish makes it suitable for your finest work . . . moreover it will save you money.

A phone call or letter will start Udylite's "66" Bright Nickel process on its way to help you improve your production. If it sounds too good to be true, just send us a sample of your product . . . we will be happy to test-plate it for you with Incomparable "66". Act TODAY!

**SUPER "66"** For even greater brightness and levelling where absolute maximum ductility is not demanded, Udylite's SUPER "66" may be specified. You must see this finish to believe its brilliance.

the udylite corporation

detroit 11, michigan • world's largest plating supplier

*Consult* our staff, about your specific plating problems.

# Rhodium
## ELECTROPLATING SOLUTIONS

Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.

Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.

Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.

Since 1901

**SIGMUND COHN MFG. CO., INC.**

121 SOUTH COLUMBUS AVENUE • MOUNT VERNON, NEW YORK

. . . the newest concept in **DEGREASING**

**NOW VAPOR CONTROL BY REFRIGERATION**

The ERIE-DEGREASER refrigeration system keeps the solvent vapor inside where it does a complete cleaning job. Regardless of the weather outside, solvent vapor remains inside—chilled and condensed by Freon 12. An ERIE-DEGREASER assures you of less evaporation, less 'drag-out'. Plan now for an ERIE-DEGREASER and save solvents—cut maintenance costs—improve working conditions. Write for the informative brochure on the newest concept in degreasing today.

# ERIE-DEGREASER
PATENTED

A DIVISION OF **ERIE ENGINE & MFG. CO.,** ERIE, PA.

# These workpieces get the "Touch of Gold" in this barrel

... Because greater value is added to each product as it is finished with Norton TUMBLEX* abrasives. Let us show you how this "Touch of Gold" can save you money and perform your barrel-finishing and your polishing operations better.

Send in your parts to our Sample Processing Department. We'll finish them using the latest type of tumbling equipment . . . selecting the correct abrasive from our complete line . . . and give you a detailed report on methods and equipment.

Send your parts to NORTON COMPANY, General Offices, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

# BELKE Improved Spring Clamp Cathode Hook

### *A Life Saver for Chrome Plating and Anodizing*

Powerful spring tension maintains heavy contact pressure — eliminates partial plating and costly rejects that so often occur with gravity contact.

### *Prevents creeping with Rod Agitation*

Holds each rack exactly where it is set on the cathode rod. Avoids tangling and dropping parts into the solution.

### *Easily changed from Rack to Rack*

To install just cut off the present hook and bolt on the BELKE Spring Clamp Hook. No need to get a Clamp Hook for every rack — just change the hooks from idle racks to the racks in use.

### *Locks rigidly Just squeeze to put on or take off*

Made for rack spines of all sizes and makes

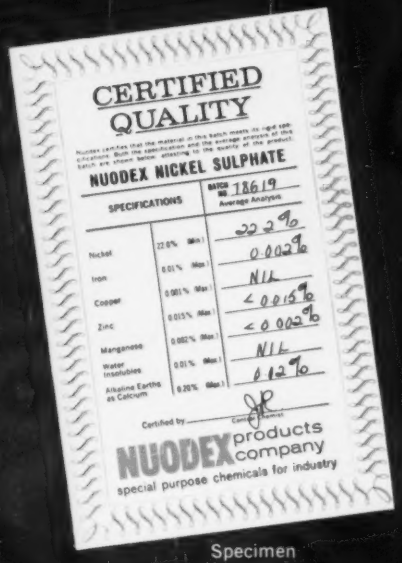
Made for 1", 1¼", 1½" and 2" Cathode Rods

### *When ordering please specify*

1. Diameter of cathode rod
2. Width and thickness of rack spines
3. Maximum amperage required by rack

Belke MANUFACTURING COMPANY
947 Cicero Ave., Chicago 51, Ill.
TRADE MARK
EVERYTHING FOR PLATING PLANTS

# The most important benefit in plating today


CERTIFIED QUALITY

NUODEX NICKEL SULPHATE

| SPECIFICATIONS | | BATCH NO. 78619 Average Analysis |
|---|---|---|
| Nickel | 22.0% (Min.) | 22.2% |
| Iron | 0.01% (Max.) | 0.002% |
| Copper | 0.001% (Max.) | NIL |
| Zinc | 0.015% (Max.) | < 0.0015% |
| Manganese | 0.002% (Max.) | < 0.002% |
| Water Insolubles | 0.01% (Max.) | NIL |
| Alkaline Earths as Calcium | 0.20% (Max.) | 0.12% |

Certified by ... Controller

NUODEX products company
special purpose chemicals for industry

Specimen Certificate

Every package of Nuodex Nickel Plating Chemicals bears a signed certificate with complete specifications and exact analysis. There's no doubt about it. Only Nuodex gives you this assurance of consistent high quality and purity. Buy the best . . . it costs no more.

NICKEL SULPHATE • CHLORIDE • CARBONATE

*Also available*—**Nickel Acetate • Formate • Nitrate**

*Sold exclusively through leading suppliers of plating chemicals. Write for the name and address of the one nearest you.*

**NUODEX** special purpose chemicals for industry

**NUODEX PRODUCTS COMPANY • ELIZABETH, NEW JERSEY**

A Division of Heyden Newport Chemical Corporation

**Fungicides • Nickel Salts • Organic Peroxides • Paint Additives • Stearates • Vinyl Additives**

DOW

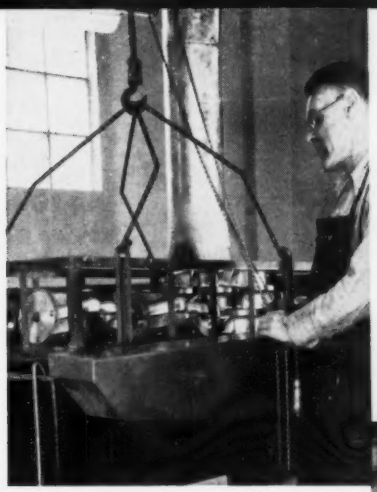
**metal cleaning report no. 2**

*case histories from your Distributor of Dow Solvents*

Flo-ball rocket valves are cleaned ultra-fine with Chlorothene. Fire hazards and toxicity problems are virtually nonexistent.

# CHLOROTHENE MAKES ROCKET VALVES READY FOR ORBIT

**Livingston, New Jersey**—An Eastern concern in the business of manufacturing "flo-ball" valves for rockets was faced with a metal cleaning problem. They used an ultrasonic bath to remove grease and other contaminants. Problem: Toxicity and fire hazard. Distributor's answer: Chlorothene® (Dow 1,1,1-trichloroethane, inhibited). Chlorothene did the ultra-fine cleaning job demanded. But, most important, the low toxicity rating of Chlorothene plus the fact that this versatile solvent has no fire or flash point solved the fire hazard and handling problems at the same time! Happy result: Renewed long term valve contract for the New Jersey firm.



**DOW SOLVENTS MEN KNOW EQUIPMENT, TOO!**

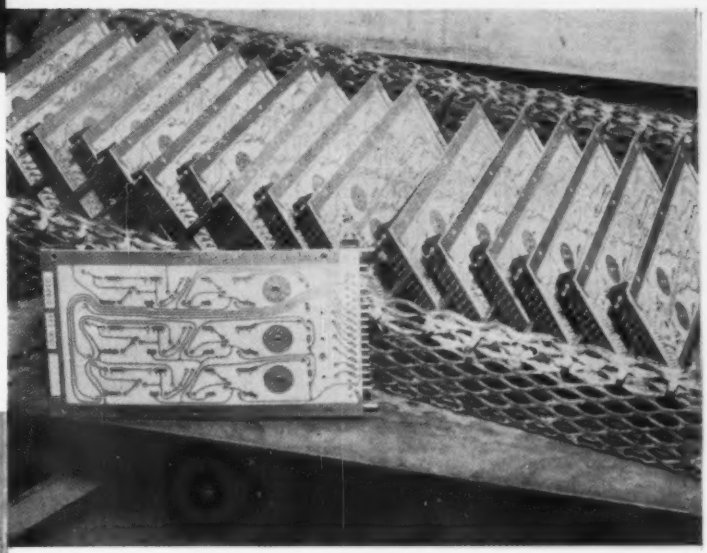
*Paris, Illinois*—An electric parts manufacturer had a problem: excessive vapors from his perchloroethylene degreasing operation. Result: solvent loss, worker discomfort, decreased production. A team from Dow and the distributor carefully studied the degreasing equipment. By changing adjustments on the machinery, the problem was solved. The condenser capacity was inadequate to condense and control the vapor. The point: Technical service men from Dow and its solvents distributors have cut their teeth on solvent and equipment problems. Their purpose in the field is to help customers. When their services are used properly, they save companies money!

**COKING PROBLEM ELIMINATED**

Machine company tried a number of brands of trichloroethylene to clean small machine parts made of brass, steel and aluminum. With each brand tried they experienced serious coking problems in their vapor degreaser. Periodically it had to be shut down for two or three days while the coal-like residue was chiseled out. The Dow solvents distributor in the area suggested NEU-TRI®, Dow's super-stable neutral type of trichloroethylene. NEU-TRI was tested for thirty days. At the end of that time, no coking deposits had appeared, and NEU-TRI has done the job ever since!

**CIRCUITOUS ROUTE TO CLEAN CIRCUITS**

*St. Paul, Minnesota*—Electronics manufacturer had to clean rosin flux from electric circuits. Trichloroethylene in this vapor degreasing operation was too slow and expensive. They had previously tried ultrasonics, but that process took the finish off the circuits. The fast, economic answer: Chlorothene, Dow's safer, more effective cold cleaning solvent. Chlorothene speeded production, did not injure the finish, reduced cleaning costs 16%! Now they complete the circuit on time!



*Time and time again*, Dow solvents distributors help manufacturers improve cleaning and stripping operations. And for two good reasons: (1) Dow offers the widest line of chlorinated solvents for modern industry; (2) Dow backs its distributors to the hilt with technical information and on-the-job help. Chances are good that one of the many Dow industrial solvents can help smooth out your operations, too. Dow solvents are made to high purity standards and each is designed to do a specific job and do it well. For help on your metal cleaning problems call on the nearby Dow solvents distributor. His name is listed on the next page.

* TRADEMARK

**THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN**

**FREE . . .**
**TECHNICAL SERVICE**
**on 24-hour notice**

Your distributor of Dow solvents will gladly help you with any problems you are experiencing with metal cleaning solvents. He can have a trained solvents specialist en route to your plant within 24 hours after your call is received!

Ask your Dow solvents distributor for details.

**CHLOROTHENE®**
**TRICHLOROETHYLENE**
**PERCHLOROETHYLENE**
**METHYLENE CHLORIDE**

## See Your Distributor of Dow Solvents First!

# FOR HELPFUL METAL CLEANING INFORMATION
## get in touch with your Dow Solvents Distributor

DOW

**LETTER KEYS: (C)**—Chlorothene®; **(M)**—Methylene Chloride; **(P)**—Perchloroethylene (Industrial); **(T)**—Trichloroethylene

**ALABAMA**
BIRMINGHAM—Wittichen Chemical Company **(C M P)**
BIRMINGHAM—F. H. Ross and Company **(C M P T)**
MOBILE—Barada and Page, Inc. **(C M)**
MOBILE—McKesson & Robbins, Inc. **(C M P T)**
MOBILE—F. H. Ross and Company **(C M P)**
MONTGOMERY—Wittichen Chemical Company **(C M P)**

**ARIZONA**
PHOENIX—Braun Chemical Company **(C M P T)**
PHOENIX—Western Chemical Company **(C M P)**
TUCSON—Western Chemical Company **(C M P)**

**CALIFORNIA**
LOS ANGELES—Braun Chemical Company **(C M P T)**
LOS ANGELES—McKesson, Mefford Chemical Division **(P)**
LOS ANGELES—Pemaco, Inc. **(P T)**
OAKLAND—B. N. Meacham Company **(C)**
SAN DIEGO—Braun Chemical Company **(C M P T)**
SAN DIEGO—Buel Town Company **(T)**
SAN FRANCISCO—Braun-Knecht-Heimann Co. **(C M P T)**
SAN FRANCISCO—G. N. Meacham Company **(C)**
SOUTH GATE—American Mineral Spirits **(P)**

**COLORADO**
DENVER—Braun-Knecht-Heimann Company **(C M)**
DENVER—Chemical Sales Company **(C M P T)**
DENVER—McKesson & Robbins, Inc. **(C M P T)**
DENVER—Mine and Smelter Supply Company **(C M P T)**
GRAND JUNCTION—C. D. Smith Co., Chemical Div. **(C P T)**

**CONNECTICUT**
NEW HAVEN—H. Krevit and Company, Inc. **(P T)**
SHELTON—Axton-Cross Company **(C M P T)**
SOUTH NORWALK—McKesson and Robbins, Inc. **(C M P T)**
SOUTH NORWALK—Guard-All Chemical Company **(P T)**

**FLORIDA**
JACKSONVILLE—F. H. Ross and Company **(C M P T)**
JACKSONVILLE—Amica Burnett Chemical Co. **(C M P T)**
MIAMI—Amica Burnett Chemical Company **(C M P T)**
MIAMI—Biscayne Chemical Laboratories **(C M P T)**
ORLANDO—Atlantic Chemicals, Inc. **(C M P T)**
TAMPA—Atlantic Chemicals, Inc. **(C M P T)**

**GEORGIA**
ATLANTA—Chapman Chemical Company **(T)**
ATLANTA—McKesson and Robbins, Inc. **(C M P T)**
ATLANTA—F. H. Ross and Company **(C M P T)**
ATLANTA—Southern States Chemical Company **(C M P T)**
BIRMINGHAM—Chapman Chemical Company **(T)**
COLUMBUS—F. H. Ross and Company **(C M T)**
DUBLIN—Textile Aniline Chemical Company **(T)**

**IDAHO**
BOISE—Van Waters and Rogers, Inc. **(C M P)**

**ILLINOIS**
AURORA—River Valley Chemicals Inc. **(C M P T)**
CHICAGO—Central Solvents and Chemicals **(C M P)**
CHICAGO—C. P. Hall Company **(C M P T)**
CHICAGO—Keystone Aniline and Chemical Co. **(C P)**
CHICAGO—McKesson & Robbins, Inc. **(C M P T)**
CHICAGO—Joseph Turner and Company **(C M P T)**
DECATUR—McKesson & Robbins, Inc. **(C M P T)**
EFFINGHAM—Wabash Independent Oil Company **(C P T)**
PEORIA—McKesson & Robbins, Inc. **(C M P T)**
ROCKFORD—Industrial Oil and Chemical Company **(C)**
ROCKFORD—Viking Chemical Company **(C M P T)**

**INDIANA**
EVANSVILLE—Charles Leich and Company **(P)**
FT. WAYNE—Hoosier Solvents and Chemicals **(C M P)**
FT. WAYNE—Inland Chemical Corporation **(C M P)**
HAMMOND—Inland Chemical Corporation **(C M P T)**
INDIANAPOLIS—Hoosier Solvents and Chemicals **(C M P)**
INDIANAPOLIS—Wm. Lynn Chemical Company **(C M P)**
INDIANAPOLIS—Lynn Solvents Corporation **(T)**
INDIANAPOLIS—Ulrich Chemical Company, Inc. **(T)**
KOKOMO—Plating Products, Inc. **(P T)**
LOGANSPORT—Plating Products, Inc. **(P T)**
SOUTH BEND—Inland Chemical Corporation **(C M P T)**
SOUTH BEND—Stevens Oil Company **(C M P)**

**IOWA**
BETTENDORF—Barton Naptha Corporation **(C M P T)**
BURLINGTON—McKesson and Robbins, Inc. **(C M P T)**
CEDAR RAPIDS—McKesson and Robbins, Inc. **(C M P T)**
COUNCIL BLUFFS—Barton Solvents, Inc. **(C M P T)**
DAVENPORT—McKesson & Robbins, Inc. **(C M T)**
DES MOINES—Barton Naptha Company **(C M P T)**
SIOUX CITY—McKesson and Robbins, Inc. **(P)**
SUMNER—Overton Chemical Sales **(C)**

**KANSAS**
WICHITA—Barada and Page, Inc. **(C M)**
WICHITA—Reid Supply Company **(C P T)**

**KENTUCKY**
LOUISVILLE—Dixie Solvents and Chemicals **(C M P)**
LOUISVILLE—Gans Chemical and Supply Company **(P)**
LOUISVILLE—McKesson and Robbins, Inc. **(C M P T)**

**LOUISIANA**
BATON ROUGE—Barada & Page, Inc. **(C)**
LAKE CHARLES—Barada and Page, Inc. **(C M)**
NEW ORLEANS—Barada & Page, Inc. **(C)**
NEW ORLEANS—Southern Solvents and Chemicals **(C M P T)**

**MAINE**
LEWISTON—Polar Chemical Company **(C M P T)**

**MARYLAND**
BALTIMORE—B. J. Howard Company **(C M P T)**
BALTIMORE—Leidy Chemicals Corporation **(C M P)**
BALTIMORE—Seiler Chemicals **(C)**
BALTIMORE—Tilley Chemical Company **(T)**

**MASSACHUSETTS**
BOSTON—Howe and French, Inc. **(C M)**
BOSTON—Linder and Company, Inc. **(C M P T)**
BOSTON—McKesson and Robbins, Inc. **(C M P T)**
EVERETT—Sessions-Gifford Co., Inc. **(C M P T)**
FRAMINGHAM—Axton-Cross Corp. of Mass. **(C P T)**
HINGHAM—Stephen-Roger, Incorporated **(C M P T)**
HOLYOKE—Eastern Chemicals, Inc. **(M)**
SPRINGFIELD—Chemical Corporation **(C M P T)**
SPRINGFIELD—Hampden Color and Chemical Co. **(C M P)**
STONEHAM—George Mann & Co. **(C M P T)**
WORCESTER—George H. Clark and Co. **(C M P T)**

**MICHIGAN**
DETROIT—Eaton Chemical and Dyestuff **(C M)**
DETROIT—Manpro Corporation **(C M P T)**
DETROIT—McKesson and Robbins, Inc. **(C M P T)**
DETROIT—Western Solvents and Chemicals **(C M P)**
DETROIT—Whitfield Chemical Company **(P)**
EAST DETROIT—Sherwood Chemical Company **(P)**
ESCANABA—Haviland Products Company **(C M P)**
FERNDALE—Manpro Corporation **(C M P T)**
GRAND RAPIDS—P. B. Gast and Sons Company **(C)**
GRAND RAPIDS—Haviland Products Company **(C M)**
GRAND RAPIDS—Wolverine Solvents and Chemicals Co. **(C M P)**
LANSING—Carrier Stephens Company **(C P)**
LANSING—Wheaton Chemical Company **(C P T)**
LUDINGTON—P. B. Gast and Sons Company **(C)**

**MINNESOTA**
MINNEAPOLIS—W. H. Barber Company **(P T)**
MINNEAPOLIS—McKesson and Robbins, Inc. **(C M P T)**
MINNEAPOLIS—Tripoli Refining Corporation **(M P T)**
ST. PAUL—Lyons Chemicals, Inc. **(C M P)**

**MISSISSIPPI**
JACKSON—F. H. Ross and Company **(C M P)**

**MISSOURI**
KANSAS CITY—Barada and Page, Inc. **(C M)**
KANSAS CITY—Missouri Solvents and Chemicals **(C M P)**
KANSAS CITY—Sherwood and Company, Inc. **(C M P T)**
ST. LOUIS—Barada and Page, Inc. **(C M)**
ST. LOUIS—Independent Oil Company **(C M P T)**
ST. LOUIS—McKesson and Robbins, Inc. **(C M P T)**
ST. LOUIS—G. S. Robins and Company **(C M P)**
ST. LOUIS—St. Louis Solvents and Chemicals **(C P T)**
ST. LOUIS—Missouri Solvents and Chemicals **(C M P)**

**NEBRASKA**
OMAHA—Barton Solvents, Inc. **(C M P T)**
OMAHA—McKesson and Robbins, Inc. **(C M P T)**

**NEW JERSEY**
BLOOMFIELD—McKesson & Robbins, Inc. **(C M P T)**
CAMDEN—Callahan Chemical Company **(M P T)**
EAST PATERSON—Aetna Color and Chemical Company **(C M P T)**
MURRAY HILL—American Mineral Spirits **(C M P T)**
NEWARK—American Oil and Supply **(C P)**
NEWARK—National Oil and Supply Company **(C M P T)**
PALISADE PARK—Philip A. Hunt Company **(C)**
VINELAND—Lirio Chemical Company **(C T)**

**NEW MEXICO**
ALBUQUERQUE—Braun Chemical Company **(C M P T)**
ALBUQUERQUE—Edmunds Chemical Company **(C M P T)**

**NEW YORK**
ALBANY—Eastern Chemical **(C M P)**
ATHENS—Spick Products Company **(P T)**
BINGHAMTON—Collier Chem. **(C M)**
BRONX—Elco Solvents Corporation **(M P T)**
BROOKLYN—Enequist Chemical Company **(C P)**
BUFFALO—Buffalo Solvents and Chemicals **(C M P)**
BUFFALO—Chemical Sales Corporation **(C M P T)**
BUFFALO—McKesson and Robbins, Inc. **(C M P T)**
EDGEMERE—Hagan Industrial Supply **(P T)**
GLOVERSVILLE—Eastern Chemicals, S. H. Ireland Div. **(C M)**
KEARNY—American Chemicals, Incorporated **(C M P T)**
LONG ISLAND CITY—Peerless Oil and Chemical **(C M P T)**
NEW YORK—American Chemicals, Inc. **(C M P T)**
NEW YORK—McKesson and Robbins, Inc. **(C M P T)**
POUGHKEEPSIE—Duso Chemical Company **(C)**
RENSSELAER—Eastern Chemicals, Inc. **(C M)**
ROCHESTER—Chemical Sales Corporation **(C M P T)**
SYRACUSE—Eastern Chemicals, Inc. **(C M)**
UTICA—Monarch Laboratories **(C M P)**

**NORTH CAROLINA**
CHARLOTTE—F. H. Ross and Company, Inc. **(C M P T)**
CHARLOTTE—Moreland Chemical Company **(C M P T)**
CHARLOTTE—Southern States Chemical Co. **(C M P T)**
GREENSBORO—F. H. Ross and Company, Inc. **(C M P T)**

**OHIO**
AKRON—Farley Solvents Company **(C M P T)**
AKRON—C. P. Hall Company **(C P T)**
CANTON—Bison Corporation **(C P)**
CINCINNATI—Amsco Solvents and Chemicals **(C M P)**
CINCINNATI—Chipman Supply Company **(T)**
CINCINNATI—Herbert Chemical Company **(P T)**
CINCINNATI—McKesson and Robbins, Inc. **(C M P T)**
CLEVELAND—Man-Gill Chemical Company **(C P T)**
CLEVELAND—McKesson and Robbins, Inc. **(C M P T)**
CLEVELAND—National Solvents Corporation **(C P T)**
CLEVELAND—Ohio Solvents and Chemicals, Inc. **(C M P)**
CLEVELAND—R. W. Renton Company **(C P T)**
COLUMBUS—McKesson and Robbins, Inc. **(C M P T)**
DAYTON—Industrial Chemical Products Co. **(C P T)**
DAYTON—Ottoson Solvents, Inc. **(T)**
LIMA—Thomson Chemical Company **(C P T)**
TOLEDO—Inland Chemical Co. **(C M P)**
TOLEDO—Toledo Solvents and Chemicals **(C M P)**
TOLEDO—M. L. Wilcox Company **(C P T)**
YOUNGSTOWN—Rhiel Supply Company **(C M P T)**

**OKLAHOMA**
OKLAHOMA CITY—Barada and Page, Inc. **(C M)**
TULSA—Barada and Page, Inc. **(C M)**
TULSA—Chemical Products, Inc. **(C M P T)**

**OREGON**
PORTLAND—Van Waters and Rogers **(C M P)**

**PENNSYLVANIA**
CONSHOHOCKEN—American Mineral Spirits **(C M P T)**
EASTON—Lehigh Valley Chemical Company **(C M P T)**
ERIE—Monarch Laboratories **(T)**
McKEES ROCK—Apex Soap and Sanitary Corp. **(C P T)**
PHILADELPHIA—Alex C. Fergusson Company **(C P T)**
PHILADELPHIA—McKesson and Robbins, Inc. **(C M P T)**
PHILADELPHIA—Phillips and Jacobs, Inc. **(C M)**
PHILADELPHIA—Pioneer Salt Company **(C M P T)**
PHILADELPHIA—George Senn, Inc. **(C M P T)**
PITTSBURGH—Carmac Chemical Company, Inc. **(C P)**
PITTSBURGH—Carman-Pittsburgh Company **(C P T)**
PITTSBURGH—Dacar Chemical Products Company **(C P T)**
PITTSBURGH—Ft. Pitt Chemical Company **(C M P)**
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READING—R. W. Eaken, Inc. **(C P T)**
READING—Textile Chemical Company **(C P)**
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YORK—Industrial Solvents and Chemicals **(C P T)**

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CHATTANOOGA—Wilson Sales Company **(C M P T)**
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MEMPHIS—C. P. Hall Company **(C M P T)**
MEMPHIS—Ideal Chemical and Supply Co. **(C M P T)**
NASHVILLE—Chapman Chemical Company **(C M P T)**
NASHVILLE—Wilson Sales Company **(C M P T)**

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DALLAS—Barada and Page, Inc. **(C M)**
DALLAS—McKesson & Robbins, Inc. **(C M P T)**
DALLAS—Texas Solvents and Chemicals Co. **(C)**
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HOUSTON—W. H. Curtain and Company **(P)**
HOUSTON—Dixie Chemical Company **(C M P T)**
HOUSTON—R. M. Hughes Company, Inc. **(C M P T)**
HOUSTON—McKesson, Texas Chemical Division **(C M P T)**
HOUSTON—Texas Solvents and Chemicals Co. **(C M P)**
HOUSTON—Van Waters and Rogers, Inc. **(C M P T)**
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MIDLAND—State Chemical Company **(C M P T)**
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SAN ANTONIO—McKesson and Robbins, Inc. **(C M P T)**

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**VIRGINIA**
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AUGUST, 1959 Volume 57 No. 8


## FEATURES


Editorial — New Finishes — New Problems ..... 49

Highlights of A.E.S. Convention and Exposition ..... 50

Electrodeposition of Chromium Alloys ..... 59
*By Charles Levy*

Analysis of Sulfuric Anodizing Solutions ..... 63
*By J. B. Mohler*

Bright, Non-Brittle Acid Copper Deposits ..... 66
*By Larissa Domnikov*

Health Legislation Concerning Paint Ingredients ..... 68
*By Harold P. Preuss*

Science for Electroplaters — Part L ..... 72
*By L. Serota*


## DEPARTMENTS


| | | | |
|---|---|---|---|
| Shop Problems | 74 | Business Items | 98 |
| Patents | 76 | News from California | 106 |
| Abstracts | 82 | New Books | 109 |
| Recent Developments | 84 | Associations and Societies | 110 |
| Manufacturers' Literature | 95 | Obituary | 112 |



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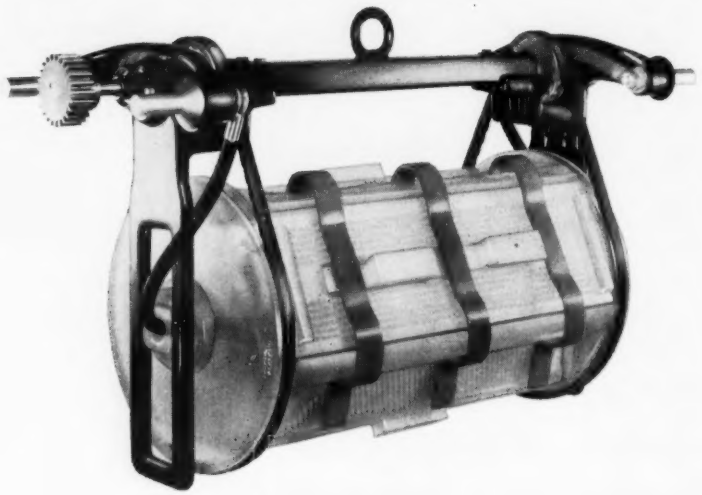

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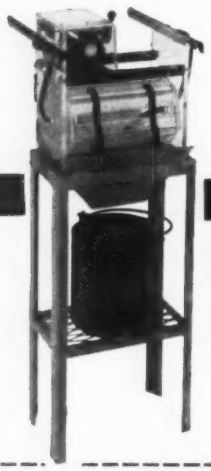

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ESTABLISHED 1903 VOLUME 57 • NUMBER 8 • AUGUST, 1959

# NEW FINISHES - NEW PROBLEMS

If a sharp-eyed finisher should happen to pass a structural steel assembly job and see welding going on within a few steps of men applying paint, he needn't brace himself for any imminent holocaust, or look frantically for the location of the nearest fire extinguisher or alarm box. The probability is that the paint is water-based.

No other phase of organic finishing is receiving so much attention today as water-reduced or emulsion-type industrial coatings, and laboratory staffs are working at a feverish rate to solve the major problems which are limiting their application. There are two of these problems which, when eliminated, will very likely put the formulator in a good position to completely replace solvent paints. The first, and most important, is the water itself.

Lacking a range of solvents to provide fast, medium, or slow drying, the finishing system must be tailored to the evaporation of water, which does not flash off like the volatile solvents. It is necessary to remove it from the paint film before baking, which may even necessitate controlled temperature-humidity drying prior to oven baking. For users who are willing to go through the trouble and expense, emulsions are available already.

The other problem is the tendency of emulsions to foam, a serious deterrent to acceptance by some important segments of the industry, flow coating for example. The time is fast approaching, however, when paint chemists will have discovered suitable methods of emulsifying the various resins and will be able to formulate emulsions of virtually any coating material which can now be put into solvents. Even emulsions of epoxy resins and alkyds have passed far beyond the exploratory stage, and others are following close behind. Seven million gallons of water acrylic were sold last year, it has been estimated.

In addition to the structural steel industry, the automotive companies, often the vanguard of finishing progress, have already given serious consideration to emulsion finishes. Ford Motor Co.'s Lincoln bodies and underframes are being coated with this type of finish, as are a number of parts produced by others, and results have been very encouraging whenever water-reducible materials were applied properly.

In commenting on the problems which must be solved before these coating materials find universal application, we have neglected to touch upon their many advantages for, just by eliminating the flammability hazard ever present in paint departments, they must eventually occupy a very prominent niche in organic finishing practice.

Nathaniel Hall

# Highlights of the A. E. S. Golden Jubilee Convention at Detroit, Michigan

## JUNE 16-19, 1959

By R. Scott Modjeska and S. P. Gary

LITTLE less than a miracle was required to knit together all of the varied events planned for the A.E.S. Golden Jubilee Convention and fit them into the five short days, June 15-19. But, since Detroit has grown accustomed to producing miracles on schedule it is not surprising that General Chairman *Wright W. Wilson* and his dynamic committee of hard working and dedicated men and women were able to turn the triple event into one of the outstanding successes of A.E.S. history.

Dovetailing the vast and varied activities of the Golden Jubilee Convention, the Fifth International Conference on Electrodeposition and Metal Finishing, and the Fifth Industrial Finishing Exposition was a tremendous undertaking and, to add to their handling problems, new Convention and Exposition attendance records were set. At the final count 1430 men, 445 women and children, had registered for the official convention activities, and the Industrial Finishing Exposition registered 10,772.

Ralph Wysong
*President, A.E.S.*

A tremendous throng crowded into the Grand Ballroom of the Statler to hear greetings and congratulations by some very interesting and great personalities including a message from the President of the United States. Follow the Call to Order by General Chairman, W. W. W. and the invocation by *Rev. Canon Irwin C. Johnson*, of St. John's Episcopal Church (also Detroit's police chaplain), the visiting international dignitaries and national and local A.E.S. officials were introduced. Detroit's colorful Mayor, *Hon. Louis C. Miriani*, and Michigan's Lieutenant Governor, *Hon. John B. Swainson*, welcomed the A.E.S. members and their international guests to Detroit and to Michigan.

During the session the living past presidents and honorary members of the Society were introduced, and the winner of the A.E.S. Scientific Achievement Award, *Dr. A. Kenneth Graham*, was introduced. A memorial list of members deceased during the year was read by the Secretary. An intensely interesting and timely address was delivered by the Keynote Speaker, *Mr. Irving A. Duffy*, Vice-President of the Body Group of the Ford Motor Company. In his talk, Mr. Duffy reviewed the recovering state of the economy and outlined the severe challenges that lie ahead for the metal finishing industry.

During the eleven educational sessions, latest developments were presented in an international atmosphere by many experts in all phases of metal finishing. Papers were presented by authors from Canada, England, Switzerland, Italy, India, Australia, France, Germany, Holland and our own United States. Among the visitors from other countries were: From Melbourne Australia, *Mr. J. Wilson* of the Turner Manufacturing Co., Ltd. From England: *Mr. W. K. Bates*, Albright and Wilson (Mfg.) Ltd., London; *Mr. A. W. Brace*,

Galaxie of prominent personages fill the speakers platform at the opening ceremony.

**Manuel Ben**
*Third Vice-President*

**Manuel Ben** graduated from University of Michigan in 1939, B.S., majored in Chemistry, returned for post graduate work and in 1940 went with the A.C. Spark Plug Division of General Motors, Bearing Department as a metallurgist. In 1946 he transferred to the Process Development Department of the A.C. Spark Plug. On January 16th, 1953 he went with General Motors Research as Supervisor of Plating Service Section of Electro Chemistry Department, under Cleve Nixon, Past President of the A.E.S.

Manuel Ben was one of thirteen members who founded the Saginaw Valley Branch of the A.E.S. in 1948. He became president of the Branch in 1952. He then transferred to the Detroit Branch and became president in May 1958.

---

Aluminium Laboratories, Banbury; *Mr. R. A. F. Hammond*, Armament Research Establishment, Woolwich; *Mr. A. A. B. Harvey*, Sunbeam Anticorrosives Ltd., Surrey; *Dr. T. P. Hoar*, Institute of Metal Finishing, London; *Mr. J. H. Lemon*, W. Canning and Company, Ltd., Birmingham; *Dr. D. H. Lloyd*, Joseph Lucas Ltd., Birmingham; *Mr. U. F. Marx*, Wilmot Breeden Laboratories, Solihull; *Mr. Alex Nicholson*, Pyrene Co., Ltd., London; *Mr. George Schmerling*, Silvercrown Ltd., London; *Dr. W. Stein*, Joseph Lucas Ltd., Birmingham; *Mr. T. E. Such*, W. Canning and Co., Ltd., Birmingham; *Mr. A. W. Wallbank*, Ionic Plating Co., Ltd., Birmingham; *Dr. S. Wernick*, Institute of Metal Finishing, London; and *Dr. H. Zentler-Gordon*, London.

From Puteaux, France, was *M. Andre Waldberg* of Waldberg, S. A. From Germany: *Dr. L. Hartinger* and *Herr F. Lohrie* of Langbein-Pfanhauser Werke, Neuss/Rhein; *Dr. H. Pickhardt*, Vereinigte Aluminum Werk A. G.; and *Dr. Richard Springer* of Frankfurt.

From Holland: *Mijnheer Dias Santilhano*, associated with L. Van der Hoorn's Chemische Technische Ind., of Utrecht. From Japan: *Mr. Minorn Nakamura*, Kanto Gakuin University, Yokohama; *Mr. T. Tohei*, Tohei Plating Company of Tokyo. From Mexico: *Sr. Andre Leites*, Manufacturera Hanson-Van Winkle-Munning de Mexico, S. A., Mexico City. From Sweden: *Mr. Folke Stigen*, Nordhs Kemiska and Elektriska Fabrik, Partille.

On Tuesday morning when the Fifth Industrial Finishing Exposition was officially opened by A.E.S. President *Herberth E. Head* and Exposition Chairman *Howard McAleer* in a ribbon cutting ceremony, the largest exhibit ever devoted to mechanical finishing was presented for the inspection and approval of the visiting metal finishers. Seemingly miles of the latest and most modern methods, processes and equipment were set up in a myriad of eye-catching displays. Many working models attracted the visitors to stop and view the company's latest development of a finishing process or equipment, and to receive souvenirs right off the production line. A trip through the exhibits aided by the helpful discussions and demonstrations of the hundreds of manufacturer's representatives was equal to an education in metal finishing.

Immediately following the opening of the Exposition on Tuesday, a special ceremony was performed to honor the memory of *Thomas A. Trumbour*, one of the founders and honorary member, who passed away September 2, 1958. Tom Trumbour was probably one of the most active members the Society has ever known. He was respected and loved by all. Present at the ceremony which included the unveiling of a fine portrait by the eminent artist *Eva Briggs*, were his son, *John Trumbour*; his daughter, *Joan Trumbour Wiarda*; *A. P. Munning*, secretary of the Metal Finishing Suppliers' Association; and *Palmer H. Langdon*. During his lifetime, Tom never missed a convention and is counted among the founding fathers of the Society.

A.E.S. delegates had a full calendar including a proposed increase in the Per Capita Tax, By-Laws changes and budget approval. $7.50 was established as the new Per Capita Tax. Two new branches, Phoenix, Arizona and Denver, Colorado were welcomed into the Society.

Following election of the 1959-60 officers, the new President, *Ralph D. Wysong* of the Studebaker-Packard Corporation, was handed the gavel and the new officers were installed. These included *Dr. W. Andrew Wesley*, 1st Vice President; *Chester G. Borlet*, 2nd Vice President; and *Manuel Ben*, newly elected 3rd Vice President. *Herberth Head*, the retiring President, was complimented on his successful handling of the many duties imposed upon him in this Golden Jubilee year and was presented with a plaque and past president's pin.

**Cutting the ribbon to open the Industrial Finishing exposition, from left to right, William M. Phillips, retired General Motors plating executive and past president American Electroplaters' Society; Walter Pinner, McGean Chemical Co.; Herberth E. Head, president A.E.S.; Manuel Ben, newly elected third vice-president A.E.S.; John P. Nichols, executive secretary A.E.S.; and Howard McAleer, chairman Industrial Finishing Exposition.**

Unveiling of portrait of the late Thomas A. Trumbour, from left to right, John E. Trumbour, son of T. A. Trumbour and Business Manager of Metal Finishing; August P. Munning, secretary of Metal Finishing Suppliers' Association; Palmer H. Langdon, publisher of Metal Finishing; Joan T. Wiarda, daughter of T. A. Trumbour and president of Metals & Plastics Publications, Inc.; and Eva Briggs, artist.

### *Awards and Honors*

Recipients of special awards and honors this year were: *A.E.S. Scientific Achievement Award*—Dr. A. K. Graham, Graham Savage & Associates —for his many contributions to the field of electroplating. Dr. Graham will deliver the William Blum lecture at the convention next year in Los Angeles.

Dr. Graham was born in Philadelphia December 25, 1896. He attended the public schools. Upon graduating from the Central High School in 1915, he was awarded a City scholarship to the University of Pennsylvania. He graduated with a degree of B.S. in chemical engineering in June 1919 after having served ten months in 1918 with the U. S. Marines in World War I.

He then worked in the Research Department of the Scovill Mfg. Company, Waterbury, Connecticut for two years. During this time he met and worked with *George B. Hogaboom*. This was the beginning of a life-long friendship. It was through this association that Dr. Graham became interested in electroplating and decided to specialize in this field.

Since there was no modern text on plating until Blum-Hogaboom published their book in 1923, Dr. Graham decided the best way to learn about plating was to work at it. This he did as a plater's helper from October 1920 until July 1921—first at the Hartford Sterling Company, Philadelphia, and then at the Welsbach Company, Gloucester, N. J.

Dr. Abner Brenner, National Bureau of Standards, presenting the A.E.S. Scientific Achievement award to Dr. A. Kenneth Graham.

The summer of 1921 Dr. Graham studied metallography at Columbia University. This was followed by five years in the graduate school of the University of Pennsylvania, during which time he served as Instructor in Chemistry and completed work leading to a technical degree of Ch.E. and graduate degrees of M.S. and Ph.D.

He then joined the Hanson-Van Winkle-Company of Newark, N. J. and became associated with George Hogaboom for the second time. He installed a laboratory at Newark and later at Matawan, N. J., when the Hanson company joined with Munning. During this period the simplified methods of analysis for plating baths were developed, the course for platers was first offered, the standard solutions for analyses were made available for platers, and the zinc-aluminum anode, which later became patented, was developed.

Starting in the fall of 1928, Dr. Graham has held the following positions.

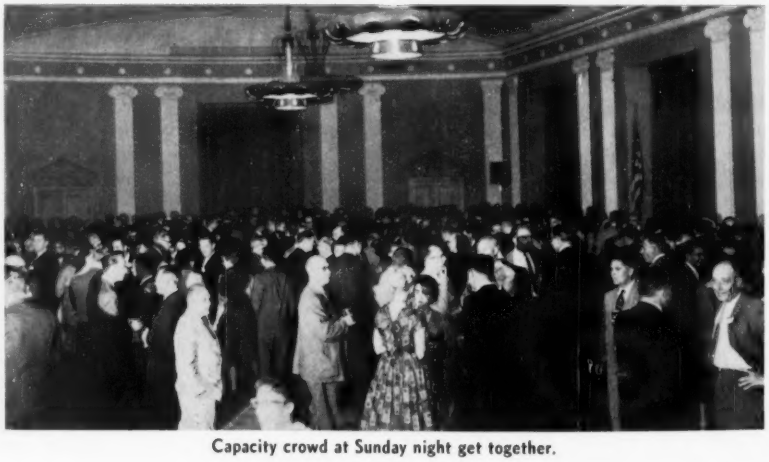
University of Pennsylvania, Philadelphia, Pa., Instructor and Assistant Professor in Chemical Engineering, September 1928 to February 1937.

A. Kenneth Graham & Associates, Jenkintown, Pa., Consulting Engineer, July 1936 to June 1942.

War Production Board, Washington, D. C., Plating Consultant and Deputy Chief, Products Branch, Conservation Division, June 1942 to June 1943.

Houdaille-Hershey Corp., Decatur, Illinois, Director of Research and Development, Garfield Division, June 1943 to August 1944.

Graham, Crowley — Associates, Inc., (later becoming Graham, Savage &



Capacity crowd at Sunday night get together.

Associates, Inc.), Jenkintown, Pa., President, September 1944 to date.

Dr. Graham joined the Newark Branch of the A.E.S. in 1926. In 1928 he transferred to the Philadelphia Branch. He organized and taught the first chemistry class for the Philadelphia Branch of the A.E.S. He has won three gold medal awards for papers from the A.E.S. He served as Executive

Frank Bueckman presents award to Dr. E. B. Saubestre, technical director of Enthone Inc.

Dr. A. M. Max receiving his paper award.

Donald Millage and Wilbur Hague receiving their awards.

Secretary of the Society from 1945 to 1951. He was elected an Honorary Member of the Philadelphia Branch in 1957.

He is also a member of the Inst. of Metal Finishing, A.S.T.M., A.C.S., A.I.Ch.E., Assoc. of Con. Chemists & Chemical Engineers, Inc., and The Electrochemical Society. He has been active on committees of most of these societies and served as Manager and Vice

Arthur W. Logozzo
*Honorary Member, A.E.S.*

Dr. George P. Swift
*Honorary Member, A.E.S.*

President of The Electrochemical Society for eleven years.

He has published over forty technical papers, obtained several patents, contributed chapters to Modern Electroplating by Gray, the A.C.S. Monograph on Copper by Butts, and the Electroplating Engineering Handbook, for which he also served as Editor-in-Chief.

### *Paper Awards*

*The Carl E. Heussner Award* (a gold medal) to Dr. E. B. Saubestre for "The Chemistry of Watts Nickel Plating Solutions."

*The A.E.S. Silver Medal*—Dr. A. M. Max—for "Factors Which Influence the Structure of Electrodeposits."

*The A.E.S. Bronze Medal*—Dr. Ernest Raub—for "Research on Microthrowing Power and Leveling of Plating Baths."

*The George B. Hogaboom Memorial Award*—Dr. E. B. Saubestre—"The Chemistry of Watts Nickel Plating Solutions." (Dr. Saubestre was commended for his presentation of three papers in this category, all of which were worthy of special mention.)

*The Chromium Plating Award*—for the best paper on the subject of Chromium Plating—Donald R. Millage and Wilbur E. Hague—"Pitting in Thick Chromium Deposits."

*New Awards*—a new award to be given for the first time next year was announced. This will be the *Proctor Leadership Award* sponsored by *Mrs. William O. Preston*, daughter of the society's founder, the late Charles H. Proctor. The recipient will receive $150.00 and an appropriate plaque.

*Awards of Merit Certificates*—were given to *Dr. D. Gardner Foulke, Dr. Walter R. Meyer, John Dale.*

*Honorary Memberships* were presented to: *Arthur W. Logozzo* and *Dr. George P. Swift.* Both are past presidents of the Society.

Capacity crowd at opening session.

### *Metal Finishing Historical Booth*

METAL FINISHING, being established seven years before the society's founding, was selected by the exposition committee to arrange a historical exhibit.

*Dr. George Dubpernell*, of the Metal and Thermit Corporation, who has been associated with the development of plating since 1919, assembled a collection of items relating to *Dr. Isaac Adams, Jr.*, and the discovery of nickel plating.

Some five hundred samples of modern finishes were suspended from the ceiling.

To give a turn-of-the-century atmosphere, the booth included a pot-bellied stove and a number of polished brass items of 1890 vintage, including a brass saluting cannon made by the late *Palmer H. Langdon*, founder of the Metal Industry, old telephones, phonograph, coffee grinder, ice cream parlor chairs, and a reproduction of our 1903 front cover in Italian glass tile made by *Mrs. Joan T. Wiarda*, president of Metals and Plastics Publications, Inc.

Other items displayed included parts plated in 1904 by *Tom Haddow*, silverware by *Elkington* plated in 1851, plated nail clippers from 1896, and a photograph of the 1929 convention in Detroit, a gold plated satellite, and a 1959 Thunderbird car.

*Nathaniel Hall*, technical editor, displayed a collection of foreign periodicals devoted to plating and finishing.

After its dedication at the ribbon cutting ceremony, the oil painting of the late *Thomas A. Trumbour* was hung in our historical booth.

A drawing was held for the Golden Jubilee Chair, just before the exposition closed, and it was won by *G. Lefevre* of AMP, Inc., Harrisburg, Pennsylvania.


### *Acknowledgements*

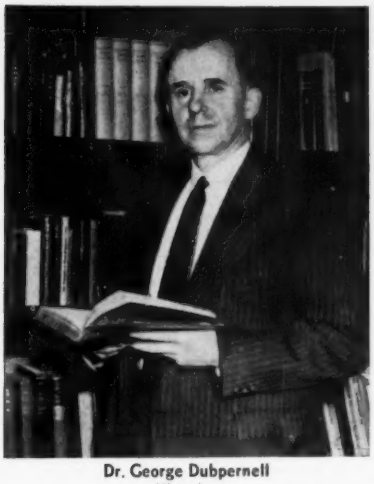
*Modern Finishes*

Allied Research Products, Inc.; Aluminum Corp. of America; Apollo Metal Works, Croname, Inc.; Dow Chemical Co.; E. I. Du Pont De Nemours & Co., Inc.; Electrochemical Products Co.; Electro-Glo Company; Enthone, Inc.; Hanson-Van Winkle-Munning Co.; Harshaw Chemical Co.; Lea Manufacturing Co.; McGean Chemical Co.; Metal & Thermit Corp.; Modern Plating; National Bureau of Standards; National Lock Co.; NRC Equipment Corp.; Promat Div. Poor & Co.; Scientific Control Laboratories, Inc.; Sel-Rex Corp.; F. J. Stokes Corp.; Technic, Inc.; Udylite Corp.

*Dr. George Dubpernell*, Isaac Adams story and many of the interesting old items which accompanied it; *Mrs. Stanley (Sally) Sax*, for the loan of many of the antiques; Metal & Thermit Corp. for gold lacquering the Metal Finishing Golden Jubilee Chair; Kosmos Electro-Finishing Research, Inc. and *Elmer Welsh* for refinishing the 1892 brass cannon; *Tom Haddow* and *Elias Schore*, display of old finishes; *Mrs. William O. Preston*, daughter of founder *Charles H. Proctor*, for first chromium plating patent and formula note book of early plating baths; Brooks and Perkins, Inc., for loan of gold plated earth satellite; *C. M. Hall* for old lamps; Ray-O-Vac Company for old and new flashlights; Fox Company for old name plates and decorative parts; H. C. Cook Company for old and new fingernail clippers; *Al Weisberg* of Technic, Inc. for picture display as well as many gold and rhodium plated pieces used in our booth.

*Fred Green* of Crown Rheostat and Supply Co.; *Robert Norton* of Hanson-

Metal Finishing booth, from left to right, John L. Meyers, Jerry O'Brien, and Palmer H. Langdon.



Dr. George Dubpernell
*Historian*

R. L. Ledford
*President, M.F.S.A.*

Dr. Henry L. Kellner
*Third Vice-President, M.F.S.A.*

Van Winkle-Munning Co.; *H. Hendrickson, George Dubpernell,* and *Harold Smallman* for old books and catalogs.

*H. A. Gilbertson* for refinishing old items, and Hardwood Line Mfg. Co. for lucite tables.

Hamilton Beach Company, Racine, Wisconsin, sent us a 1931 Hamilton Beach Food Mixer, one of the first, and a modern KCT Food Mixer with timer and bowls. The mixers were received by us in Detroit, but unfortunately were missing on June 15th. The Exposition people are making a concerted effort to locate the mixers.

### *Metal Finishing Suppliers' Association*

The generosity of the excellent manufacturers' and suppliers' group is appreciated by the members of the metal finishing industry and their "Open House" is always one of the most important get togethers of the Convention. This year they entertained the platers royally on Monday evening at the Sheraton-Cadillac Hotel. *Warney Ruhl* and his orchestra set the pace for some lively exhibitions of dancing and the platers had a wonderful time getting acquainted and swapping stories over the good food from the bountiful buffet. From time to time throughout the evening *Gus Munning*, the M.C., presented savings bond awards to six lucky ticket holders. The party was such a success that many participants swore "I could have danced all night."

Other activities of the M.F.S.A. included their annual meeting and luncheon on Monday, election of new officers, and their annual golf tournament, held at the beautiful Pine Lakes Country Club, Pontiac, Michigan. Subjects discussed at the annual business meeting included the further promotion of joint cocktail parties to precede A.E.S. branch affairs, an appropriation for a trade market study, the time interval between Industrial Finishing expositions and plans for the next meeting in July 1960. *Herman Struckhof* has been appointed MFSA liaison officer for this convention.

New officers were installed by *Manson Glover* with *Ray Ledford* of Chemray Corporation going in as president, *Fred P. Green* of Crown Rheostat and Supply Co. as first vice-president, *J. G. Carrique* of Alloycraft, Ltd., as second vice-president, and *Dr. Henry L. Kellner* of Lea Manufacturing Company as

Gene Coombs
*Trustee, M.F.S.A.*

H. J. McCracken
*Trustee, M.F.S.A.*

John E. Trumbour
*Trustee, M.F.S.A.*

third vice-president. The secretary, *August P. Munning*, continued in office, as well as the treasurer, *Ezra Blount*. New trustees elected to the board included *H. J. McCracken* of Northwest Chemical Co., *Gene Coombs* of Diamond Alkali Co. and *John E. Trumbour* of METAL FINISHING.

### *Plant Tours*

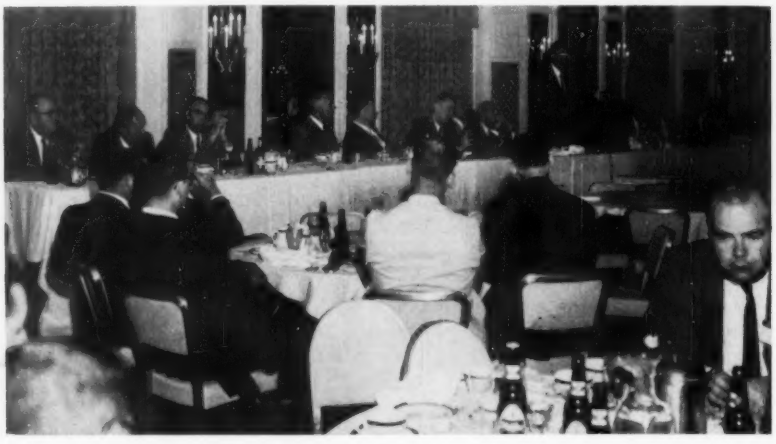
The lucky visitors who were fortunate enough to find time for the three plant tours were well rewarded though tired after the trips planned by *James Fritts*. They were able to visit the Chrysler Engineering Laboratories, the steel mill and assembly line at the Ford Rouge Plant, and to view a pilot plant plating operation and other wonders at General Motors' Technical Center.

### *Golden Jubilee Outing*

Congratulations to *Robert Dudley* who hosted the Millionaire's Party and the Ox Roast. It was a fabulous affair. Beginning at 2:00 Wednesday afternoon, on the grounds of the Artillery Armory, everyone thought they were Texas Oil Men. They had millions to play with. No Las Vegas gambling palace ever saw as much excitement as took place under the tent where millions were staked on the turn of the Big Six Wheels, Race Horse, Roulette, Chuck-a-Luck, and other games of chance. Money flowed like water and it was all free. But even though the money was phoney, the many beautiful prizes given out to those who attended were very real. The Old Fashioned Ox Roast which followed was delicious and served with all the trimmings. Poor *Bob Dudley* took a lot of kidding. It was rumored that while he had the ox on his farm for fattening up, he fed it tranquillizer pills to be sure it would remain calm and quiet and produce tender meat. That may or may not be so, but when the whole registration of the convention showed up to eat the ox, it was Bob who had to take the tranquillizers.

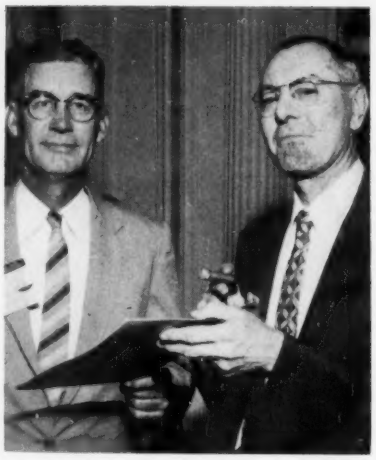
### *Golden Jubilee Banquet, Floor Show and Dance*

Always a big event at the Convention, this year *A. J. Turner* took special pains to see that this would be a top-flight affair. The reservations exceeded all expectations and though the crowd had to be divided into two different ballrooms, they didn't miss a thing.



Earl W. Couch, Lea Manufacturing Co., presides at the M.F.S.A. annual luncheon.

Howard McAleer, chairman Industrial Finishing Exposition, uses Cushman scooter to tour the wide spaces of the show.



A. P. Munning, secretary M.F.S.A., presents the first bond award at open house to H. R. Stogner.

Following recognition of the officers of the convention, visiting dignitaries, committee chairman, and their respecitve wives, an excellent floor show was presented to both groups, and two good rhythm bands furnished music for dancing.

### *Future Conventions*

It is appropriate that a visit to the Golden West should follow the Golden Jubilee. *Tony Stabile* and *George Hetz*, co-chairmen, promise an excellent program with plenty of fun and plenty to see in Los Angeles next year. Other future convention sponsoring branches and locations are:

1960—July 24-28, Los Angeles—Hotel Statler—Los Angeles.

1961—Boston—Hotel Statler—Boston.

1962 — Midwest Regional — Hotel Schroeder—Milwaukee.

1963 — Newark — Ambassador and Sheraton Ritz-Carlton Hotels—Atlantic City, N. J.

1964—St. Louis—Hotel to be selected—St. Louis.

1965—New York—Hotel Statler—New York.

Interim meetings have been scheduled for Philadelphia in 1960 and Hartford in 1961.

### *Acknowledgement*

Many of the photos in this article were furnished us through the courtesy of the H-VW-M official Convention News, published daily during the convention, by the Hanson-Van Winkle-Munning Co.

## GOLDEN JUBILEE WITH THE LADIES

By Irene Modjeska

PERSONALLY speaking, I had a wonderful time, but then I think everyone did. From the time we checked in on Sunday afternoon until Friday evening it was an endless whirl of teas, lunches, brunches, sailing, entertainment and, of course, the favorite sport, Coffee Klatching.

After making ourselves official by registering, we wandered down the hall to the English room where gracious *Alice Pillsbury* and her committee, *Mrs. Guy A. Cummings, Jr.* (Pres. of the Detroit Ladies' A.E.S. Auxiliary), *Mrs. Manuel Ben, Miss Josephine Boatman, Mrs. Howard McAleer, Mrs. John Hitchcock, Mrs. James Thomas,* and *Mrs. Wright Wilson* as well as members of the Ladies' Auxiliary, welcomed the ladies at a Tea sponsored by Siefen Compounds, Inc. It was a warm welcome and the program outlined by Mrs. Pillsbury for the ladies and children seemed fabulous. It was! We were not disappointed. From the Tea we rushed out to make ourselves pretty for the "Get Together" at 8:00. That was really fun.

On Monday we were the guests of Allied Research Products and Pillsbury Chemicals at a delightful luncheon at the Detroit Yacht Club. It was a glamorous setting with food to match. Following the luncheon, *Irene Myers* of General Electric in Fort Wayne brought forth both laughter and tears while relating her experiences with her Factory Girls of America at work and on tour with her in Europe, Mexico, etc. All of the husbands must have heard her quip about "I would rather be an old maid than to wish I were one," and all of the ladies will remember "Goldie." After a quick and wishful glimpse of the many luxury yachts at anchor outside, it was back to the hotel, to add a touch of glamour and round up the husbands for the fun, food and frolic furnished by the Metal Finishing Suppliers' Association at their Open House in the Sheraton Cadillac Ballrooms.

Tuesday was a busy day. Aunt Ella, through her personal secretary, *Dave X. Clarin,* had again persuaded the Oakite Company to sponsor their 22nd Annual Aunt Ella Society Luncheon at the Dearborn Inn. In the past it has always been Dave Clarin who surprised the ladies with his unusual and frequently exotic gifts. This year it was his turn to be surprised as Mrs. Pillsbury presented him with an alarm wrist watch and a personally signed autograph book as the gift of all the A.E.S. ladies attending the convention. The ladies have had so much fun with Uncle Dave throughout the years that it was a pleasure for each lady to make her small contribution to insure his having an alarm to remind him to take his pills on schedule and thus be around for many more years of fun with Aunt Ella. However, the ladies did not go away empty handed, for in addition to the fine gifts presented to the ladies by Dave Clarin and Oakite, each lady was presented with a lovely silk scarf imprinted with replicas of exhibits at Greenfield Village which they visited immediately following the luncheon.

The collection of exhibits at Greenfield Village and the Edison Institute were truly impressive and are a noble tribute to the early developments which have made our American Way of Life possible. We were all sorry to cut our tour short but we had a date with Joan at the Armory.

*Mrs. Joan Wiarda,* hostess at the Plato Party, must have felt especially rewarded for all her work in collecting the prizes and paraphernalia for Plato, for the ladies really registered enthusiasm. This year she was ably assisted by *Mrs. Ida Siefen Stark,* Pres. of J. J. Siefen Company, and the employees and employees' wives of that company. The prizes donated by the J. J. Siefen Company were indeed so beautiful that the excitement ran high during the play and the losers cast envious glances at the winners as they carried their packages away.

The baby who attended all ladies events.

Wednesday was a delightful day, thanks to the weatherman, who assisted the J. J. Siefen Company and the Northwest Chemical Company to provide a smooth and glamorous cruise on the sea-going and spacious Aquarama. She was a big, beautiful ship designed to satisfy everyone's desires.

Sightseers were thrilled to see the Ambassador International Bridge linking Dynamic Detroit on the one side and Windsor, Ontario, Canada on the other side, the palatial residences of the auto tycoons, the exclusive summer resorts at Grosse Point and the beautiful scenery all along the way. Others settled down to the luxury of acquiring sun tans in a deck chair, enjoying the music of the dance band, the little movie theatre and the bingo games.

In the evening we joined our husbands at the millionaires party to play for fabulous stakes at the gaming tables and share in the delicious barbecued ox served up under the watchful eye of host *Robert Dudley.*

The Champagne Brunch on Thursday was highly successful. As guests of the Udylite Corporation, at glamorous Devon Gables, we were entertained royally. Added to the exhilarating experience of a champagne cocktail and an excellent luncheon in a cool and beautiful country setting, there were more than 40 useful and beautiful door prizes distributed to the ladies. Luncheon was followed by a trip to the Research Division of the Chrysler Corporation for an education in auto styling, a hearty Tea, and a rush trip back to the hotel to prepare for the big event, the Golden Jubilee Banquet, Floor Show and Dance.

By Friday the ladies were a little tired but not too tired for an exciting and educational trip to Ford Motor Company. The tour included a visit to the Ford Plant where they were permitted to visit the steel mill and follow the assembly line from beginning to end. Some of the ladies claimed this was the most exciting event of the whole program. It was certainly a fitting end to a glorious, busy week. Thank you, ladies of Detroit. It was a wonderful program from beginning to end.

# CONFERENCE IN RETROSPECT

By S. Wernick, Ph.D., F.R.I.C., F.I.M.

*(Hon. Secretary, International Council for Electrodeposition & Metal Finishing)*

Andre Waldberg of Waldberg S. A., Paris, France, stops at the Metal Finishing Booth.

THE Golden Jubilee Convention of the American Electroplaters' Society at Detroit broke new ground not only in respect of achieving a half-century of progressive existence but also in staging the first truly International Conference in the field of Metal Finishing ever to be held in the U.S.A. It is true that the American Electroplaters' Society is also credited with the 2nd International Conference at Asbury Park in 1939 but those who attended the A.E.S. Convention in that fateful year would be the first to admit that there was very little of an international character to differentiate this meeting from any preceding A.E.S. annual convention. This was due to several factors. Despite the successful inauguration of international events of this kind by the Electrodepositors' Technical Society (forerunner of the Institute of Metal Finishing) in 1937, their importance to metal finishing interests was not yet generally realized. Furthermore, the length of travel, cost thereof and time involved were formidable points calculated to discourage European participation. (Trans-Atlantic air travel was not an everyday event then.) Apart from this the political climate in Europe was hardly conducive to the holding of such a Conference in the U. S.

With the organization of further International Conferences in 1947 and 1954 respectively in London by the Institute of Metal Finishing, the time was ripe for staging the fifth event in this series in the United States. That this decision was well-timed and eminently right was overwhelmingly demonstrated in June when the largest number of overseas visitors ever to attend a Metal Finishing Convention bore down on Detroit, and it was possible to claim that a good cross-section of the foremost technical men in America and overseas countries had come in from all parts of the world for the event. The British delegation alone was about twice as large ultimately as the official numbers listed by the I.M.F. office in London.

Apart from practically the whole of the I.M.F. Executive, headed by the President, *Dr. T. P. Hoar*, who were present, a sizeable number of British Companies had decided to send their technical men to participate in the Convention. There were, similarly, delegations from many European countries so that there could be no doubt of the international character of the event.

The very evident success of the conference was not just fortuitous. (It was also fortunately blessed by excellent equable weather which greatly helped the Europeans who are not accustomed to the hot humid weather which just preceded the opening of the Conference carrying a high "discomfort index"!)

### *Technical Program*

Nearly two years' planning had gone into the technical program alone. The International Council for Electrodeposition and Metal Finishing, under the able chairmanship of *Mr. W. Pinner*, had been in almost "continuous session," (its deliberation being processed by constant trans-Atlantic correspondence) with the object of organizing one of the most ambitious technical programs ever to be presented at a Convention. The number of papers in fact exceeded by 50%, or more, those presented at the previous International Conference in 1954. I understand from Walter that he was responsible for sending out some 1500 letters while directing the technical program. Correspondence at the British end (including circulars publicizing the event circulated all over Europe and the British Commonwealth as well as foreign members of the I.M.F.) was on a similar scale.

The 44 papers officially listed covered a very wide field in which hardly any aspect of metal finishing had been overlooked. What was particularly noticeable was the emphasis and prominence of papers bearing on organic finishing. This was particularly welcome to the British delegation in which there was strong representation by organic finishing interests. It would be invidious to comment on individual papers, or on their individual standards, but there can be no doubt as to the extent of the

(*Continued on page* 81)

The British contingency was forty strong. Many missed the picture.

# Electrodeposition of Chromium Alloys*

## A LITERATURE REVIEW

By Charles Levy, *Watertown Arsenal Labs., Watertown 72, Mass.*

**The author received a B.S. degree in Chemical Engineering from M.I.T. in 1950, and an M.S.Ch.E. from the University of Missouri in 1951. He was employed by Wright Air Development Command, Dayton, Ohio in theoretical rocket design before coming to Watertown Arsenal. Since late 1951, he has been concerned with research and development investigations of metal surface treatments. Mr. Levy has published several papers dealing with chromium plating in addition to many contributions to *Chemical Abstracts*. He is a member of the American Chemical Society, the American Electroplaters' Society, the American Society for Metals, and is currently Chairman of the Boston Section of The Electrochemical Society.**

INTEREST in the electrodeposition of alloys has been intensified in recent years. In general, this has been due to the more widespread use of electrodeposited coatings and to the failure of single metal deposits to yield the desired chemical and physical characteristics. In particular, coatings which exhibit good corrosion resistance at both ambient and high temperatures are much sought after.

The electrodeposition of brass has been practiced in industry for over one hundred years. Currently, emphasis is centered on tin alloys, major advances having been made both here and in Great Britain. Pure chromium is known to have excellent resistance to most chemical agents, and, in particular, to oxygen up to 700°C.[1] The difficulty with electrodeposited chromium, however, is that it contains an inherent structure of microcracks which extends through to the basis metal, allowing chemical attack. Dow and Stareck[2] have reported a crack-free chromium electrodeposit.

It is felt that the solution to the cracking problem in chromium lies in the development of methods to apply, relatively simply and economically, electrodeposits of chromium alloys. These deposits should possess chemical and physical properties which are equal, if not superior, to those of conventional chromium plate. An extensive literature survey has been undertaken to determine the methods already available. In a most thorough survey on alloy plating Faust,[3] in 1940, made little reference to chromium alloy plating, showing the lack of interest at that time. The principles of alloy plating have been well described by Blum and Hogaboom[4] and by Faust.[5] Most of the baths to be described are aqueous solutions. Fused salt baths in which a single metal is alloyed with the cathode surface have not been considered, nor have composite deposits of two or more metals, where the deposits are heat treated to form an alloy.

### *Chromium-Iron Deposits*

The major portion of the work done on electrodeposition of chromium alloys has been concerned with alloys of chromium and iron. A number of investigators have reported that iron has little effect on deposits obtained from conventional chromium trioxide plating baths. Alter and Mathers[6] stated that up to 50 g./l. of ferric ion did not affect the deposition of chromium, but higher concentrations did. In their study of throwing power in chromium plating baths, Farber and Blum[7] concluded that up to 2N ferric ion decreases the bright plating range and increases throwing power slightly. Kasper[8] found that only 0.10% iron deposited from a 2.5M chromium trioxide bath containing 1N ferric ion, and deposits made at 45°C. and 10 amp./dm.$^2$ were not bright. Addition of 25 g./l. ferrous carbonate produced negligible quantities of iron in the deposit, according to Gardam.[9] Cassel,[10] Schneidewind,[11] Phillips,[12] and Baker [13] also reported no iron in deposits from chromium trioxide baths.

Other investigators have reported that chromium-iron alloys can be deposited by making additions to chromium trioxide baths. Brenner, Burkhead, and Jennings[14] found that deposits containing 6-9% iron could be obtained from baths containing chromium trioxide, ferric dichromate, sulfate, and magnesium ions. Although the deposits contained up to 2.85%

**The statements and opinions expressed herein are those of the author and do not necessarily indicate the views or the policy of the Army Ordnance Corps.*

oxygen, the physical properties were inferior. Burr and associates[15] added ferrous sulfate to 4.0M chromium trioxide at sulfate ratios below 10:1 to produce deposits with up to 10% iron. Current efficiencies seemed to decrease with time of use of the solutions, apparently due to excessive build-up of trivalent chromium. The deposits, however, contained fewer cracks than conventional chromium plate.

Baths containing 1-2.5M chromium sulfate, 0.5M ferrous sulfate, and 0.005-1.0M sulfuric acid (to give a pH of 1.0 to 1.3) were reported by Fuseya and Sasaki[16] to yield deposits of 16-65% chromium, 1-5% oxygen, balance iron. Current density was 74-139 amp./dm.$^2$ at 15°C. and current efficiency 14% or less. Holt's and Kharlamov[17] also used mixed chromium and iron sulfates, to a total metal concentration of 1.6M, with a chromium to iron ratio of 1.5:0.1 moles. Current density was 10-15 amp./in.$^2$ and temperature 20-40°C., to yield an 80% chromium — 20% iron alloy. More recently, Yoshida and Yoshida[18] suggested use of a bath of 0.3M chromium sulfate, 0.3M ferrous sulfate, 2.2M ammonium sulfate, and 3.0M urea, at a pH of 2.4-2.8. Current density of 8-16 amp./dm.$^2$ gives a deposit containing 18-19% chromium. Baths of similar compositions have recently been patented by Yoshida.[19]

A patent by I. G. Farbenindustrie A.-G. (Alexander Siemens, inventor),[20] claims a deposit of a chromium-iron alloy from a bath of 370 g./l. $K_2Cr_2O_7$, 250 g./l. chromium trioxide, 7 g./l. chromic oxide, and 80-100 g./l. ferrous sulfate. Safranek and Shaer[21] reported the physical properties of an unspecified electrodeposited chromium-iron alloy. Snavely, Faust, and Bride[22] claim deposition of a 94% chromium—6% iron alloy, which retains its hardness of 600-700 Knoop up to 1100°F. The bath composition is based on chromium and ferrous ammonium sulfates, sodium sulfite and magnesium and ammonium sulfates, at a pH of 1.7. Current density is 400 amp./ft.$^2$ at a temperature of 145°F. A patent issued to Safranek[23] claims deposition of a bright 85% chromium—15% iron alloy on steel at 115°F., at a pH of 1.8-2.0 and a current density of 200 amp./ft.$^2$ The bath consists of 300 g./l. $CrNH_4(SO_4)_2 \cdot 12H_2O$, 150 g./l. $(NH_4)_2SO_4$, 5 g./l. $Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$, and 0.5 g./l. methylpyridinium chloride, the latter as a supplementary brightening agent. Fuseya and Sasaki,[16] however, concluded that a chromium ammonium sulfate bath was not suitable for deposition of chromium since their results were poor. Lloyd[24] reports that alloys containing over 50% iron have been produced at low current efficiency, but gives no details. Finally, Lihl and Jenitschek[25] isolated a chromium-iron alloy at a mercury cathode.

### *Chromium-Nickel Deposits*

As far back at 1894, Placet and Bonnet[26] claimed deposition of chromium-nickel alloys from solutions of chromium sulfate and nickel sulfate, acidified with sulfuric, phosphoric, hydrochloric, oxalic, or fluosilicic acids. Dokras[27] has recently reviewed and discussed chromium-nickel codeposition. Krämer[28] added 1% nickel as oxide, hydroxide, carbonate, or dicarboxylic acid salt to a chromium trioxide solution. Alter and Mathers[6] reported similar results with nickel as with iron, as did Cassel.[10] Kasper[8] found that up to 1N $Ni^{++}$ in a chromium trioxide bath had no effect on deposition of bright chromium. Additions of nickel dichromate to chromium trioxide baths yielded only a few tenths of a percent nickel in the deposits according to Brenner.[14] Burr and associates[15] found that no satisfactory plates could be deposited from a nickel ammonium sulfate bath similar to that used for chromium-iron by Snavely, Faust, and Bride.[22] Starting with 4M solutions of chromium trioxide, nickel sulfate or nickel ammonium sulfate were added. Best results were obtained with a 10:1 $CrO_3$ to $SO_4^=$ ratio, the nickel being added as sulfate. However, only the bath containing chromium trioxide and nickel ammonium sulfate in a 5:1 ratio showed nickel present in spectrographic analysis.

Skalozubov and Vlasova[29] electrodeposited a chromium-nickel alloy from a bath containing 250 g./l. chromium trioxide, 250 g./l. nickel sulfate, and 25 g./l. boric acid at a current density of 30-35 amp./dm.$^2$ and temperature 35-40°C. Ratios of chromium to nickel in the deposit can be varied by changing ratios of bath constituents, and the chromium content increases with increasing current density. Wallace[30] claimed electroplating of a nickel-chromium alloy on steel using an alloy anode. The bath was made up of 32-96 oz./gal. nickel sulfate, 16-32 oz./gal. chromium carbonate, boric acid, and water. Yoshida and Yoshida[18] suggest that chromium-nickel alloys may be deposited in a similar manner to the method they used for chromium-iron alloys.

In 1953, Quaely[31] deposited chromium-nickel alloys at a current density of 75-100 amp./dm.$^2$ at a temperature below 40°C. The bath composition included 200 g./l. chromium trioxide, 20 g./l. nickel chloride, and 5 ml./l. glacial acetic acid. The deposits were subsequently blackened by immersion in hydrochloric acid. The plating method was patented.[32] Albin[33] claims a method for brush plating a chromium-nickel alloy. Two solutions were used, one containing nickel chloride, zinc chloride, ferric chloride, and water. The other has potassium chromate, hydrochloric and sulfuric acids, and water. The solutions are poured together at 25°C. and alternating current is passed as an activation treatment prior to use with a carbon rod anode and sponge. Varying compositions of chromium-nickel alloys were obtained by Natanson and Kozachek[34] from organosols in a two-layer bath. The aqueous solution contained $NiCl_2$, $CrCl_3$, $NH_4Cl$, urea, and HCl. The organic layer was composed of oleic acid and toluene. Again, Lihl and Jenitschek[25] have obtained chromium-nickel alloys at a mercury cathode.

### *Chromium-Cobalt Deposits*

Adding up to 50 g./l. cobalt chromate to a chromium trioxide bath prevented deposition, as reported by Alter and Mathers[6], while Brenner, Burkhead, and Jennings[14] state that cobalt dichromate additions yielded alloys inferior to conventional chromium plate. Humphries[35] patented electrodeposition of a cobalt-chromium alloy for razor blade edges. In 1923, Peffer and Pierce[36] patented a method for depositing chromium-cobalt from a solution of mixed sulfates or



g./l. ferrous sulfate, and 25 g./l. boric acid. Optimum

11. R. Schneidewind, U. Mich. Eng. Res. Bull. #19 (1928).

chlorides. Schulte[37] formed a plating bath by combining a portion of a solution of 50-75 parts cobalt sulfate, 30-40 parts sodium sulfate, 5-15 parts hydrofluoric acid and 250 parts water with a larger proportion of a solution formed from 75 parts chromium trioxide, 3 parts potassium hydroxide, 10 parts fluosilicic acid, and 250 parts water. Yoshida and Yoshida[18] suggest that chromium may be alloyed with cobalt in a manner similar to iron. DuRose[38] suggests the addition of cobalt carbonate to a chromium plating bath composed of chromic acid and fluoboric acid to prevent anode sludge formation. Candussi[39] claims deposition of a chromium-cobalt alloy on steel or aluminum.

### *Chromium-Tungsten and Chromium-Molybdenum Deposits*

Serious consideration has been given to the electrodeposition of chromium-tungsten and chromium-molybdenum alloys. Brenner, Burkhead, and Jennings[14] were not able to develop successful deposits by adding tungsten or molybdenum in the form of complexes of phosphoric, hydrofluoric, or boric acid to chromium trioxide plating baths. Armstrong and Menefee[40] have patented a method which utilizes a tungsten carbide anode alloyed with chromium to yield an alloy deposit from an acidic aqueous solution of tungsten oxyfluoride. Another patent[41] sets forth addition to a tungsten oxyfluoride bath of an acid salt of the metal to be alloyed. The solution is maintained at a pH of 4.5-6.8, and a temperature of 35-80°C. Rogers and Burr[42] deposited chromium alloys with up to 30% tungsten from a solution of 2M chromium trioxide reduced to a trivalent chromium content of 40% with 300 g./l. ammonium citrate, and containing 150 g./l. tungstic anhydride. Deposits had excellent appearance and corrosion resistance, although appreciable (0.0001") thicknesses could not be built up.

A method for electroplating chromium-molybdenum alloys has been patented by Ma.[43] One to 30% molybdenum is obtained by dissolving molybdic anhydride in an aqueous chromium trioxide solution containing sulfuric acid. The use of a chromium-molybdenum alloy anode is preferred, at a current density of 15 amp./dm.$^2$ and temperature of 40°C. a plate 0.003" thick which contains 22.4% molybdenum will deposit in five hours. Shome[44] has deposited an alloy containing 1.7% molybdenum and 98.1% chromium, which can be brightened by polishing. The bath composition was 360 g./l. $H_2MoO_4$, 400 g./l. $CrO_3$, and 4 g./l. $H_2SO_4$, at plating conditions of 40°C. and 1 amp./in.$^2$

### *Miscellaneous Binary Chromium Deposits*

Many other alloys of chromium have been under investigation. Cassell[10] tried, in addition to iron and nickel, zinc, cadmium, silver, arsenic, and lead-mercury, with poor results. Concentrations below 50 g./l. of copper, zinc, cadmium, vanadium, or aluminum, as well as ferric ion, nickel, or molybdenum, did not affect deposition from the chromium trioxide bath, according to Alter and Mathers.[6] Kasper[8] found that, although 1N zinc, cadmium, copper, or nickel had no effect on bright chromium plating baths, copper was found to be present to the extent of 0.08% in the deposit. Placet and Bonnet[26] claimed deposition of aluminum, magnesium, zinc, tin, antimony, silver, or platinum, as well as nickel and cobalt, as alloys of chromium. Marino[45] patented a method for deposition of an alloy of zinc, cadmium, aluminum, tin, cadmium, lead, antimony, nickel, cobalt or chromium by electrolysis of the tartrates, paratartrates, or oxalates of these metals in aqueous ammonia. Yoshida and Yoshida[18] suggest manganese as a co-deposited metal for chromium, while Shaffer[46] added $MnO_2$, $K_2Mn_2O_8$, $MnCl_2$, and Rochelle salts to $CrO_3$ plating baths.

A novel method for deposition of alloys including chromium has been patented by Cole.[47] It consists in placing anodes of the metals to be alloyed at various distances from the cathode to form the desired alloy proportions. An apparatus is described in which the current for each electrode is separately adjustable. Rojas Chemical Works[48] has patented a bath which contains, as a soluble aluminum compound, 5-15% of the chromium trioxide content, calculated as aluminum hydroxide. Gardam[9] determined that 15-25 g./l. aluminum, added as hydroxide, produced negligible quantities of almuminum in deposits from chromium trioxide baths. Up to 38.7 g./l. indium sulfate has been added to a conventional chromium plating bath by Hackerman,[49, 50] although indium was present to only a very small amount in the deposit. Rogers and Burr[42] could not achieve successful deposition of chromium-titanium alloys, but these compositions are claimed by Candussi[39] and by Sugahara.[47] The latter used an aqueous solution containing 250 g./l. $CrO_3$, 2 g./l. $H_2SO_4$, and 5 g./l. $TiSiF_6$, at a current density of 30 amp./dm.$^2$

Quaely,[31, 52] and Quaely and Lilliendahl,[53] have patented a method for electrodeposition of a black chromium-vanadium alloy from an electrolyte containing 150-350 g./l. chromium trioxide and 2-10 g./l. vanadium as soluble halides, nitrates, or vanadates. Addition of 3-20 g./l. of acetic, formic, citric, oxalic, or propionic acid improved plating characteristics. Two baths patented by Rojas[54] contain zinc or barium. One composition is 400 g. chromium trioxide, 41-287.5 g. zinc sulfate, and 12-81.4 g. zinc oxide, with sufficient water for dissolution. The second bath, which was combined with the first to yield the final solution, contains 600 g. chromium trioxide, 28-197.4 g. barium carbonate, and 81.4 g. zinc oxide. Greater throwing power than the conventional bath is claimed over wide ranges of current density and temperature. A more recent Rojas patent,[55] claims improvement of chromium electrodeposition from zinc-containing baths similar to the aforementioned. Nickel or aluminum may be added in lieu of the zinc. Chromium in the quantity 0.01-40 g./l. is listed by Weiner[56] as an addition agent to a cadmium cyanide plating bath. Jennison and Bradley[57] claim a codeposit of tin with approximately 10% chromium. Patents covering the use of strontium chromate and sulfate in chromium trioxide plating baths have been issued to Passal,[58] to Stareck,[59] and to Stareck and Dow.[60]

### *Ternary Chromium Alloy Deposits*

In 1940, Skalozubov and Goncharova[61] followed their work on chromium-nickel alloys by development of a bath of chromium-trioxide, 250 g./l. nickel sulfate, 175

g./l. ferrous sulfate, and 25 g./l. boric acid. Optimum current density was 50 amp./dm.$^2$ at a temperature 60°C. Increase in current density caused an increase in chromium and a decrease in nickel and iron in the deposit. Raising the bath temperature decreased current efficiency and chromium content of the deposit. Frantsevich-Zabludovskaya[62] obtained chromium alloys with 2.8-7.7% molybdenum and 2.8-23.75% nickel. The bath composition was 320 g./l. chromium sulfate, 100 g./l. nickel sulfate, 100 g./l. ammonium molybdate, and 10 g./l. boric acid. The bath was pre-electrolyzed to contain 5-6% hexavalent chromium at a approximate pH of 2. With platinum anodes, the coating was bright and dense.

Ternary, black chromium alloys were produced by Quaely[31, 63] by adding 2-10 g./l. of vanadium as a soluble compound to the chromium-nickel bath previously described.[32] Quaely and Lilliendahl[53] have patented another ternary alloy bath, the composition being 200 g./l. chromium trioxide, 80 g./l. nickel chloride, and 5 g./l. vanadium, which is dissolved in a minimum of nitric acid.

Candussi and Lovantina[64] claim deposition of chromium hydride deposits from two baths, one containing nickel, ammonium, and cobalt sulfates, boric acid and water; the other, chromium trioxide, sulfuric acid, cobalt sulfate, and water. A white brass coating has been patented by Fischer.[65] A mineral acid and 25 g./l. chromium trioxide are added to a potassium cyanide bath containing zinc and copper. The current density is 1-5 amp./dm.$^2$ and the temperature 20-50°C. Fuchs[66] claims an electrodeposited alloy of 1-40% chromium, 1-40% tungsten and the remainder nickel. Finally Neuendarff and Sauerwald[67] electrolyzed a fused chromite (58% $Cr_2O_3$, 15-17%, $Fe_2O_3$, MgO and $Al_2O_3$) with silicon dioxide. Using a carbon cathode, a deposit containing 39.5% chromium, 49.4% iron, and 7.3% carbon was obtained.

Although a considerable number of claims have been made, in practice it has generally been found that the chromium alloy deposit was either difficult to prepare, or it offered no substantial improvement over conventional chromium plate in physical or chemical characteristics. Judging from the success achieved in the alloying of bulk metals, there is no reason to expect less in the field of alloy coatings. It is anticipated that further research will yield plating methods which are both practical and economical.

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(*Continued on page* 65)



**TABLE 2**

# Analysis of Sulfuric Anodizing Solutions

By J. B. Mohler, *Seattle, Washington*

### *Introduction*

A FRIEND asked: "Can we titrate a sulfuric acid anodizing bath by the use of a pH meter?" Obviously we can, since we can use indicators, but why should we? It is a matter of personal preference. Indicators are preferred because they are easy to use. Others prefer a pH meter because the end-point is sharply defined; there is no guess as to whether or not to add a little more reagent, and no doubt as to whether the end-point has already been passed.

The concentration of sulfuric acid in an anodizing bath is not critical when held within practical limits. The bath also will tolerate aluminum, that is normally dissolved, almost to the point of saturation. The following limits, for example, are considered to be practical to control a 15% $H_2SO_4$ bath:

| | g./l. | oz./gal. |
|---|---|---|
| $H_2SO_4$ | 150-165 | 20-22 |
| Al | 0- 15 | 0- 2 |

Impurities from the alloying elements in the aluminum will accumulate in the bath. These, such as, copper, iron, chromium, and manganese obviously will introduce errors in the analyses. However, experience has shown that these are present in minor amounts and that control by simple titrations is satisfactory when they are ignored. Since they are not critical the bath is assumed to consist of sulfuric acid plus aluminum sulfate.

Analytical terms are employed to describe the meaning of the titrations:

*Total Acid* is the total sulfate as $H_2SO_4 + Al_2(SO_4)_3$ expressed as $H_2SO_4$.

*Free Acid* is the $H_2SO_4$ or total hydrogen ion expressed as $H_2SO_4$.

*Combined Acid* is the sulfate combined with aluminum expressed as $H_2SO_4$.

Total Acid = Free Acid + Combined Acid.

$$\text{Aluminum} = \text{Combined Acid} \times \frac{2\ \text{Al}}{3\ H_2SO_4}$$

The method described in the METAL FINISHING GUIDEBOOK is satisfactory.[1] Total acid is determined by titration with sodium hydroxide to a phenolphthalein end-point and free acid is determined by the same procedure after complexing the aluminum with an addition of potassium fluoride. A double indicator method is also applicable.[2] Free acid is determined by titration with sodium hydroxide to a methyl orange end-point and total acid is determined by continuing the titration to a phenolphthalein end-point.

### *Titration — pH Curves*

Solutions of sulfuric acid and aluminum sulfate were prepared and titrated with 0.992 N NaOH. Samples of the solutions were pipetted into a 400 ml. beaker, stirred with a magnetic stirrer and standard NaOH was introduced from a burette. The pH, as measured with a glass electrode, was noted after each addition. The sodium hydroxide was standardized by titration of 25 ml. of standard HCl using methyl orange as an indicator.

The data are shown as the graphed pH curves and are summarized in Table 1.

Analysis of the data showed that free acid is approximately neutralized by titration to pH 3.6 at point A and total acid by titration to pH 8.9 at point B. Points A and B correspond to the methyl orange and phenolphthalein end-points. Point C at pH 10.0 corresponds

**TABLE 1**

***Analyses of $H_2SO_4$ — $Al_2(SO_4)_3$ Solutions with pH Meter (5 ml sample)***

| No. | $H_2SO_4$ g./l. | Al g./l. | vol. ml | NaOH pH 3.6 ml | $H_2SO_4$ calc. g./l. | NaOH pH 8.9 ml | Al calc. g./l. | NaOH pH 10.0 ml | Al calc. g./l. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 9.7 | 200 | 0.0 | 0 | 5.7 | 10.2 | 7.3 | 9.7 |
| 2 | 174 | 0.0 | 200 | 17.6 | 171 | 17.9 | 0.4 | 17.9 | 0.4 |
| 3 | 175 | 9.7 | 200 | 17.7 | 172 | 23.1 | 9.6 | 25.1 | 9.9 |
| 4 | 175 | 9.7 | 100 | 17.8 | 173 | 22.9 | 9.1 | 24.6 | 9.2 |
| 5 | 175 | 4.9 | 200 | 17.4 | 169 | 20.3 | 5.2 | 21.2 | 5.1 |
| 6 | 175 | 4.9 | 300 | 17.6 | 171 | 20.6 | 5.3 | 21.4 | 5.1 |
| 7 | 87 | 4.9 | 200 | 8.6 | 83 | 11.6 | 5.3 | 12.4 | 5.1 |
| 8 | 175 | 7.3 | 200 | 17.6 | 171 | 21.7 | 7.3 | 23.2 | 7.5 |

**TABLE 2**
***Colorimetric Analyses of $H_2SO_4$ — $Al_2(SO_4)_3$ Solutions***
***(5 ml sample)***

| No. | $H_2SO_4$ g./l. | Al g./l. | NaOH Methyl Orange ml | $H_2SO_4$ calc. g./l. | NaOH Phenol-phthalein ml. | Al calc. g./l. |
|---|---|---|---|---|---|---|
| 1 | 175 | 4.9 | 17.5 | 170 | 20.1 | 4.6 |
| 2 | 175 | 9.3 | 17.5 | 170 | 22.8 | 9.5 |

to resolution of the precipitated aluminum hydroxide.

The reactions are as follows:

$$\text{to A: } H_2SO_4 + 2NaOH = Na_2SO_4 + 2H_2O$$

$$\text{A to B: } Al_2(SO_4)_3 + 6NaOH = 2Al(OH)_3 + 3Na_2SO_4$$

$$\text{B to C: } Al(OH)_3 + NaOH = NaAlO_2 + 2H_2O$$

Curve 1 reveals that the pH of an aluminum sulfate solution is 3.6 at a dilution of 200 ml. The solution became cloudy as the first few drops of sodium hydroxide were added and became clear again just about at pH 10.0 (point C). The aluminum is completely precipitated at point B although this is not obvious from curve 1. Curve 2 shows that sulfuric acid is just about neutralized at A and that it is just past neutralization at B and C.

Samples of acid and aluminum were titrated at the several dilutions of Figure 2. Dilution did not shift A appreciably but it did shift B and C to a small extent at 200 ml compared to 100 ml.

Figure 3 on a different aluminum concentration and several dilutions shows that A, B, and C are increased by dilution from 200 to 300 ml, but to a smaller extent than from 100 to 200 ml. Results were approximately as expected from calculations based on points A and B or A and C and a dilution of 200 ml.

Different concentrations of sulfuric acid and aluminum were titrated at a dilution of 200 ml as in Figure 4, showing a similarity in the shape of the curves. Most of the curves show definite breaks above A and B and C, revealing the completion of each of the reactions.

### *Quantitative Results*

Calculated sulfuric acid is low by 3 to 6 g./l. at 200 ml. This can be compensated by titration to a slightly

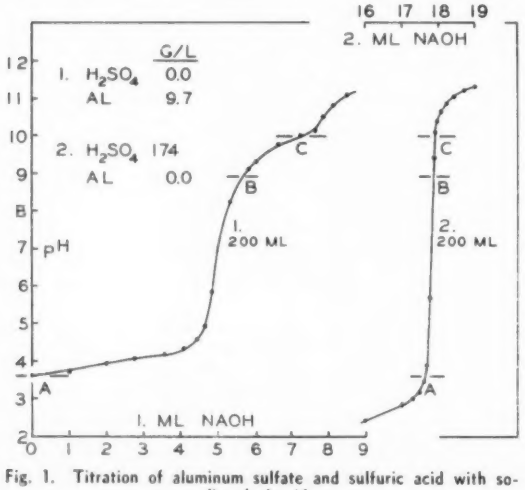


Fig. 1. Titration of aluminum sulfate and sulfuric acid with sodium hydroxide.

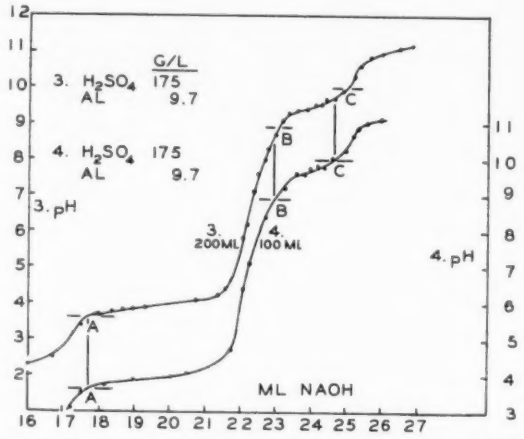


Fig. 2. Titration of a $H_2SO_4$ — $Al_2(SO_4)_3$ solution at 100 and 200 ml.

higher pH. However, curves 1 and 2 indicate that pH 3.6 is the best compromise to define the point at which the acid is neutralized and none of the aluminum is precipitated. Also, curve 3 breaks sharply just above this point, so that an increased pH could invite errors. The error can be reduced by using sulfuric acid as a standard. In other words, the sulfuric acid of curve 2 can be used as a standard, in which case the NaOH becomes 1.010 N. This makes the free acid error quite small and will have little effect on an aluminum calculation from the smaller continued titration. The sodium hydroxide is better standardized then by titration of standard sulfuric acid to a pH of 7.0 using a glass electrode.

The calculated aluminum results are sufficiently accurate for control purposes. There is an error due to titration of a small part of the acid, calculated as Al, as shown by sample 2 of Table 1. This cannot be avoided but, since it is known, it can be subtracted if maximum accuracy is desired. It was not subtracted from the tabulated results and, in general, it can be seen that the Al results are slightly high. However, other impurities will be present to introduce small errors in a working bath and small corrections are hardly warranted unless the total errors are known. From the practical standpoint, the analyses of other metals and correction of errors would not be justified. It would be better to analyze for the aluminum by gravimetric analysis if it is desired to know the aluminum content more exactly.

Aluminum calculated from C-A is closer to the aluminum added. On the other hand, calculated results from B-A are good. However, a titration to C is larger than to B and, thus, will tend to increase the accuracy slightly.

Notice in curves 4 and 8 that the data points are

erratic between B and C. This is due to a lag caused by dissolving of the aluminum hydroxide. Therefore, if pH 10.0 is used as an end-point, a fraction of a minute should be allowed for complete dissolving of the precipitate. Also a magnetic stirrer is recommended to hasten the end-point. There is very little lag to points A and B, so hand stirring is satisfactory to these points.

There is some advantage to titrating to both B and C. The ratio of C-A to B-A is 4 to 3. A check on this ratio serves as a quick check on errors. Even though we expect no trouble from errors, a check is worth while when the time involved is almost negligible.

### *Titration with Indicators*

Samples were titrated using a mixed indicator. Two drops each of methyl orange and phenolphthalein were added to a 5 ml sample in a 250 ml flask. The samples were titrated concentrated to keep the colors of the end-points as deep as possible. Results of Table 2 are good, showing that this is a very simple practical method. Results are a little low, so we may titrate confidently to definite orange and definite pink end-points. The orange end-point will be recognized since a few drops of reagent beyond this point will cause cloudiness when a reasonable amount of aluminum is present. An orange, slightly cloudy end-point is reliable although a definitely cloudy or turbid end-point is not recommended.

The following methods are recommended as suitable to control acidity and aluminum in sulfuric acid anodizing baths:

DOUBLE INDICATOR METHOD:

Pipette a 5 ml sample into a 250 ml flask. Add 2 drops of methyl orange indicator and 2 drops of phenolphthalein indicator. Titrate with normal NaOH to a definite orange or very slightly cloudy orange end-point and record as titration A. (Avoid a definitely cloudy end-point and remember that the turbidity is dependent on the quantity of aluminum present.) Continue titrating to a definite pink end-point and record as titration B.

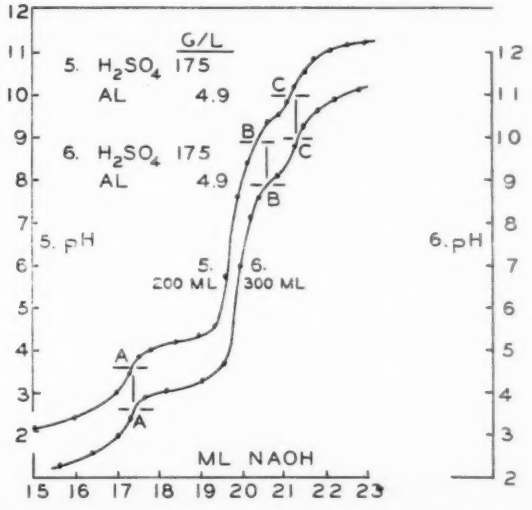


Fig. 3. Titration of a $H_2SO_4$ — $Al_2(SO_4)_3$ solution at 200 and 300 ml.

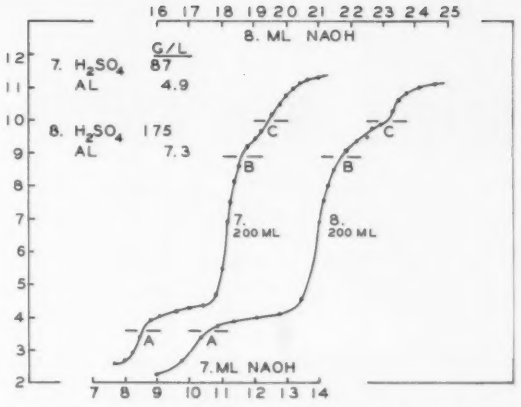


Fig. 4. Titration of two different $H_2SO_4$ — $Al_2(SO_4)_3$ solutions at 200 ml.

pH METHOD:

Pipette a 5 ml sample into a 400 ml beaker and dilute to approximately 200 ml. Titrate, while stirring, with normal NaOH to a pH of 3.6, using a glass electrode. Continue titrating to pH 10.0 and record as titration C.

ml A × N × 9.80 = g./l. $H_2SO_4$
ml (B-A) × N × 1.80 = g./l. Al
ml (C-A) × N × 1.35 = g./l. Al
ml A × N × 1.31 = oz./gal. $H_2SO_4$
ml (B-A) × N × 0.240 = oz./gal. Al
ml (C-A) × N × 0.180 = oz./gal. Al

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## ELECTRODEPOSITION OF CHROMIUM ALLOYS

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# Bright, Non-Brittle Acid Copper Deposits

By Larissa Domnikov, *Process Analyst A, Norair Division, Northrop Corp., Hawthorne, Calif.*

ELECTRODEPOSITION of bright, non-brittle copper coatings has recently attracted attention of Russian scientists. Protective-decorative copper deposits normally are subjected to buffing or chemical brightening in sulfuric-nitric-hydrochloric acid solutions. These processes, however, would have certain disadvantages. A method of bright coppering would eliminate these disadvantages by reducing the total fabrication time of components and, consequently, their cost.

Three Russian researchers, *B. P. Persiantseva, N. T. Kudriavtsev* and *B. M. Calb*, of the Mendeleev Institute of Chemistry and Technology, in Moscow, conducted an extensive research on developing a method of producing non-brittle, bright copper deposits 20-25 microns (0.0008-0.001") thick. They described their test methods and results in "Metal Science and Treatment" published in the U.S.S.R.

Bright copper deposits from cyanide and acid electrolytes have been mentioned in literature. Thiourea has been found to act as an effective brightening agent in acid electrolytes, even though at certain concentrations it produces very brittle deposits which cannot be used in excess of 5 microns (0.0002") in thickness.

The following electrolyte was tested in the Russian printing industry for coppering print cylinders:

250 grams/liter (33.3 oz./gal.) $CuSO_4 \cdot 5H_2O$
50 grams/liter (6.6 oz./gal.) $H_2SO_4$
0.005 gram/liter thiourea
0.5 gram/liter sodium salt of 2,6 (and 2,7) naphthalenedisulfonic acid (to reduce the brittleness caused by the thiourea).

In electrodepositing copper on rotating cylinders in the air-agitated electrolyte, the current density was 10 amp./dm.$^2$ (93 amp./ft.$^2$). The temperature of the electrolyte was in the range of 15-22°C. (59-72°F.). The hardness of the resulting copper deposits was up to 250 kg./mm$^2$.

### *Test Methods and Results*

The Russian scientists conducted laboratory and pilot-plant tests with the solutions of the aforementioned composition. The results were used in setting up a copper plating process at a mechanical plant in Tula.

The laboratory tests were conducted in two electrolytic tanks of one- and six-liters capacity equipped with moving cathodes. The cathode agitation was perpendicular to the anodic plane. In testing the effect of air agitation on the consumption of thiourea and on the quality of the deposits, purified air was used to agitate the electrolyte.

Low-carbon steel samples with a surface area of 0.2 sq. dm. (approximately 3 sq. in.) were used in these tests. Electrolytic copper plates were used as the anodes. Depending on the current density, the plating time was varied in order to obtain deposits 20 microns (0.0008") thick.

The pilot-plant tests were conducted in a tank of 200-liters (approximately 53 gallons) capacity. To maintain the temperature in the range of 12-20°C. (54-68°F.), the tank was equipped with cold water lead coils. Here too electrolytic copper plates in cloth bags were used as the anodes. (The total anode area was 150 sq. dm. (16 sq. ft.). The cathode current density was twice the anode current density. A box and window bolts were plated in these tests. Unlike the laboratory tests, the cathode agitation in the pilot-plant tests was parallel to the anodic plane.

Electrolytes with various copper sulfate concentrations (from 146 to 250 grams/liter (19.4-33.3 oz./gal.) were tested. The concentrations of sulfuric acid, of sodium salt of 2,6-2,7-naphthalenedisulfonic acid, and of thiourea were 90, 0.5 and 0.005 grams/liter respectively. The current density was 3-10 amp./dm.$^2$ (27.9-93 amp./ft.$^2$), and the temperature was 12-20°C. (54-68°F.).

In the process of electrodeposition, as the brightness of the copper deposits disappeared, thiourea was added periodically to the electrolyte. Naphthalenediacid was added at the rate of 0.04-0.06 gram/ampere-hour.

Data given in the table indicate that, up to a certain current density, all three electrolytes produced bright copper deposits. With an increase in copper sulfate concentration, the current density producing bright deposits can be increased somewhat. However, in solutions with high copper sulfate concentration, a rapid saturation of the anodic film and subsequent formation

***Effect of Copper Sulfate Concentration on Quality of Deposits***

| Concentration $CuSO_4 \cdot 5H_2O$ grams/liter | Current Density, amp./dm.$^2$ | | | | | |
|---|---|---|---|---|---|---|
| | 3 | 4 | 6 | 7 | 8 | 10 |
| 146 | Bright, even | | | Semi-bright | Dull, burnt edges | — |
| 200 | Bright, even | | | Even, bright | Semi-bright | — |
| 250 | Bright, even | | | Bright | Bright | Dull burnt edges |

of copper sulfate crystals takes place. Therefore, it was decided to use an electrolyte with the medium copper sulfate concentration of 200 grams/liter (26.6 oz./gal.). The optimum current density for this solution was 3-6 amp./dm.$^2$ (27.9-55.8 amp./ft.$^2$).

The thiourea concentrations greatly affect the quality of the copper deposits. Insufficient concentrations produce dull deposits, and high concentrations produce brittle, laminated ones. Thiourea consumption was determined on the basis of the appearance of the deposits (transition from bright to dull), and the amount of current in ampere-hours which produced bright deposits was also determined. The cathodes were changed after plating 15-20 microns (0.0006-0.0008") of copper.

As soon as the deposits began to turn dull, thiourea solutions in 0.5% sulfuric acid were added to the bath. In the laboratory tests the researchers used a 25% solution and, in the pilot-plant tests, they used a 1% solution of thiourea. The total volume of electrolyte was kept constant, and the tests were conducted with the current densities producing bright deposits; the cathode current density was twice the anode current density.

It was established that, in the process of electrodeposition, the thiourea consumption fluctuates within a wide range. With cathode agitation, the average thiourea consumption was 0.0012 gram/ampere-hour. With air agitation, the thiourea consumption was approximately twice that resulting from mechanical agitation, but the type of agitation does not significantly affect the quality of the deposits.

To establish the upper limits of the thiourea concentration, solutions containing various additions (0.005-0.085 gram/liter) were tested. The results indicated that, in order to produce bright copper deposits of relatively small thicknesses, 10-20 microns (0.00040-0.0008"), the thiourea concentrations may reach 0.05 gram/liter. These deposits, however, are very brittle and lack good adhesion to the basis metal. Thiourea concentrations in excess of 0.085 gram/liter produce dull streaks on the bright surface. The same phenomenon was observed with the insufficient thiourea concentrations (0.005 gram/liter). This defect results from an uneven current distribution on the surface being plated and can be eliminated by changing the rack design or by doubling or tripling the current density. Uneven, brittle, bright deposits are often formed in the electrolyte with high accumulations of decomposition products of thiourea and of naphthalenediacid, also when the bath temperature exceeds 20-25°C. (68-77°F.).

The decomposition products or the excess of thiourea can be removed by treating the solution with oxidizing agents. Using strong agitation, 5-7 ml of a 30% hydrogen peroxide solution should be added per liter of

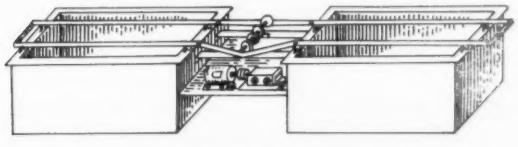

Fig. 1. Diagram of Industrial Plating Installation

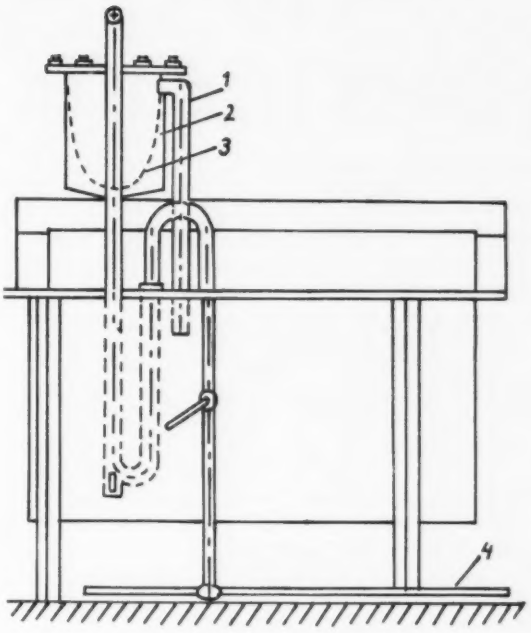


Fig. 2. Filtering Installation.

1—Connecting Polyvinyl Plastic Tube
2—Polyvinyl Plastic Electrolyte Tank
3—Cloth Filter
4—Air Pipe

electrolyte. After 12-24 hours, the electrolyte is heated to 80-90°C. (176-194°F.) and is kept at that temperature for 30-40 minutes. The electrolyte is then allowed to settle and is filtered.

In the absence of hydrogen peroxide, the bath can be purified by means of 0.5 gram of potassium permanganate per liter of plating solution. After purifying the electrolyte, the brighteners are added in the amount equal to the initial concentration.

### *Industrial Application*

Two tanks with a capacity of 1500 liters (396 gallons) each were installed in the plating department of a mechanical plant in Tula for bright coppering of ironware. Plating was conducted in the electrolyte of optimum copper sulfate concentration of 200 grams/liter (26.6 oz./gal.) but, unlike the laboratory tests, the sulfuric acid concentration was reduced to 50 grams/liter (6.6 oz./gal.) since, with a sulfuric acid concentration of 90 grams/liter (12 oz./gal.), the anodes passivate much faster, especially with the higher anode current densities.

The cathode current density was 3-4 amp./dm.$^2$ (27.9-37.2 amp./ft.$^2$). The bath voltage was 3.5-4.5. Two moving cathode rods (30 strokes per minute) and three anode rods were installed on each tank (Fig. 1). The total surface area of components treated at one time was 300-400 sq. dm. (32.2-43 sq. ft.).

During operation, the electrolyte was periodically adjusted by adding brighteners. Thiourea was added in the form of a 1.2% solution in a 5% solution of sul-

(*Continued on page 71*)

# Health Legislation Concerning Paint Ingredients

By Harold P. Preuss

### *Introduction*

IN this country, as well as abroad, people are becoming more health conscious. Legislation is being considered in many localities which is designed to minimize contact with those chemicals which are injurious to our well being. Generally speaking the United States leads the world in this type of legislation, although in many foreign areas, notably Europe and South America, a similar awakening is taking place.

An example of this type of legislation in the food field is an amendment to the Federal Food, Drug and Cosmetic Act,[1] signed into law last September. This amendment regulates the use of additives in food materials, and places the onus on a manufacturer to prove conclusively to the officials of the Federal Food & Drug Administration that a new food additive is indeed harmless before it can be used.

But there are numerous chemicals with which we may come in contact that are not food materials or even packaging materials for foods. Some of these may contain or consist of materials deleterious to health.

### *Paints Applied to Objects Handled by Children*

Certain types of paints may be used to coat toys and cribs used by small children, and which they may lick on or chew. For the most part, the use of harmful ingredients in such paints was for a long time left to the judgment of the paint manufacturer, and at least part of the responsibility lay on the user of the paints.

In 1955 however, the American Standards Association, under the sponsorship of the American Academy of Pediatrics, published specifications[2] to "Minimize Hazards to Children from Residual Coating Materials." The specifications were designed to be used as a guide to aid the manufacturer, the consumer and the general public, but bore no legal significance. However, producers of any goods conforming to the specifications were, and still are, encouraged to include in their advertising and labels a statement that the coating can be safely used on surfaces "which might be chewed by children." The actual wording of the standard is simple; in essence it states that in order for a coating to be safely applied to toys or to articles for interior use in dwelling units, where these might be chewed by children, the coating should not have a lead content in excess of one per cent and should not contain compounds of antimony, arsenic, cadmium, mercury, selenium or barium (soluble by stirring for 10 minutes with 5% hydrochloric acid at room temperature).

Officials of several state and municipal governments in the United States have felt, however, that additional safeguards were needed. As a consequence, regulations have been passed by these governments to restrict the use of paints containing harmful ingredients. These regulations have taken the form of legally requiring the paint manufacturer to state on the label of a given paint product that it may safely be used to coat childrens' toys or similar objects.

New York City's Sanitary Code was the first piece of legislation to embody such a regulation[3] becoming effective November 1, 1955. It provides that any paint containing more than one per cent of lead shall bear the following statement on the label:

*Contains lead. Harmful if eaten. Do not apply on toys, furniture or interior surfaces which might be chewed by children.*"

In addition it should contain the word "*Caution*", "*Warning*" or "*Danger*". The legend should be placed in a prominent place on the immediate container in legible letters in conspicuous contrast with other printing appearing on the container.

A similar regulation became effective in Baltimore, Maryland on July 9, 1958.[4] According to the City Code, under the heading of "Health", all paints containing more than one per cent of lead must bear this label:

"*Warning — Contains Lead. Harmful if eaten. Do not apply on any interior surfaces of a dwelling, or a place used for the care of children, or on window sills, toys, cribs, or other furniture.*"

The law is enforced by the Commissioner of Health and violations are subject to a fine not exceeding $100.00 for each offense.

In Kansas, a law enforced by the State Board of Health became effective on July 17, 1958. This law[5] approaches the problem somewhat differently by prohibiting the sale of any toy if it is coated with preparations having a lead content in excess of one per cent. It goes on further to prohibit the sale of—

Toys made of toxic plastics;

Toys filled with toxic fluids;

Toxic bubble-forming materials;

Crayons, chalks, modeling clays, doughs, etc., containing toxic materials.

The Kansas regulations also require that paints containing over one per cent of lead be labeled as follows:

"*Contains lead or other compounds harmful if eaten*"

"Do not apply to toys, furniture or interior sur-

faces which might be chewed by children. Use with adequate ventilation. Avoid breathing vapor or spray mist. Avoid prolonged contact with skin. Wash thoroughly before eating or smoking. Keep container closed when not in use."

Illinois has also enacted legislation in this field. A law[6] which became effective there on July 1, 1958 requires that the following label:

"*Caution: Contains lead or other compounds harmful if eaten*"

be affixed to containers having paint containing more than 1% lead. The letters must be easily legible and should be in conspicuous contrast with other printing appearing on the container. The law is enforced by the State Department of Agriculture, Division of Foods and Dairies.

### *Other Laws Designed to Protect the Public Against Health Hazards Involved When Using Products Containing Certain Chemicals*

In addition to the foregoing legislation pertaining to labeling of paints which may be accidentally chewed by children, other types of laws have been on the statute books for several years. By and large these laws require that labels be affixed to paints and allied products to warn the users of these materials against health hazards inherent in them due to inhalation of vapors, absorption through the skin, etc.

A California State law[7] requires that a label be placed on any mixture containing a potentially hazardous material. Substances considered hazardous include acrolein, acrylonitrile, allyl alcohol, allyl chloride, aniline, arsenic, trichloride, benzene (benzol), calcium cyanide, carbon disulfide, carbon tetrachloride, chlorophenol, cyanides—inorganic (excluding hydrocyanic acid liquid and calcium cyanide), dimethylaniline, dimethyl sulfate, ethylene chlorohydrin, formaldehyde, hydrocyanic acid liquid, hydrocyanic acid (solution), hydrogen sulfide, mercury bichloride (mercuric chloride), methanol, methyl bromide, nitrobenzene, oxalic acid, paraformaldehyde, phenol, white phosphorus, silver nitrate, sodium peroxide, tetrachloroethane, and xylidine, etc. The label must name the chemical and indicate the type of hazard involved. If the mixture does not contain one of these chemicals, but is dangerous by virtue of the fact that it presents a poison, or irritation hazard, then it must bear an appropriate label such as: "*Contains lead compound.*"

Chemicals such as iso-amyl acetate, for example, whose fumes are dangerous when inhaled, or irritate the skin, should bear this legend on the label: "Avoid prolonged breathing of vapor. Use with adequate ventilation. Avoid prolonged or repeated contact with the skin."

Poisonous compounds, such as formaldehyde, methanol, mercuric chloride, etc., must contain a skull and crossbones on the label as well as the word "*Poison*" plus information concerning an antidote.

The labeling legislation is very specific for a large variety of chemicals, and it is recommended that the statute itself be consulted.

This legislation is enforced in California by General Law Enforcement Officers.

The inclusion of the word "*Poison*" on a label, plus the skull and crossbones is required in Hawaii when a product is likely to cause death. In addition, the label should clearly state the type of chemical, such as "lead compound."

For chemicals such as ethyl acetate, for example, whose vapors are dangerous when breathed, the label should state "Use with adequate ventilation. Avoid prolonged breathing of vapor. Avoid prolonged or repeated contact with skin."

Here again it is advised that reference be made to the specific piece of legislation[8] because of the large number of chemicals mentioned and specific labeling data given for each one.

The legislation is enforced in Hawaii by the Bureau of Industrial Hygiene, Dept. of Health, in Honolulu.

Illinois regulations do not mention specific labels for specific chemicals, as do the aforementioned locations. However, warning labels for hazardous materials must mention:

1. The name of product. When the complete chemical name cannot be shown, the label should at least clearly state the type of substance, e.g., "lead compound."
2. In order to indicate the degree of severity, one of these signal words must be used in order of diminishing severity of hazard:
   (a) "*Danger*"
   (b) "*Warning*"
   (c) "*Caution*"
3. A statement of the hazard involved, such as "*causes burns*" must be placed on the container.
4. Precautionary measures to be taken should be included. An example of this legend would be: "*Avoid Breathing Dust*"
5. Simple first aid instructions should be included when contact or exposure are severe, and where immediate treatment is desirable.

The regulations[9] include a table which may be used as a guide in the selection of precautionary statements on warning labels.

The Indiana State Board of Health has been given the authority to enforce a statute (effective January 1, 1958) governing the labeling of household substances which may be injurious to health. Such substances which may contain poisonous ingredients must be registered with the Secretary of the State Board of Health. The substances must be labeled so as to clearly state the chemical name of the ingredient.

Manufacturers, wholesalers and distributors of paints, varnishes and lacquers have been notified that the following products, if they contain poisonous chemicals as specified in the regulations, fall under the provisions of this Act:

Paint and varnish removers.
Paint solvents and thinners.
Lacquer thinners.
Oil stains.
Asphalt tile and linoleum cement removers.
Brush cleaners; oxalic acid; turpentine; shellac thinners; wood preservatives; mineral spirits.
Miscellaneous products containing trichlorobenzene, paradichlorbenzene, petroleum distillates.

In Kansas[5] paints, varnishes and similar products intended for domestic use, and which are toxic by inhalation, ingestion or skin contact must bear the label—"Avoid prolonged or repeated contact with skin. Avoid prolonged breathing of vapor or spray mist. Keep container closed when not in use."

Clear liquids, such as thinners, must bear the warning:

*"Do Not Take Internally"*

Products which contain odorless solvents must bear the words on the label:

*"Use With Adequate Ventilation."*

Regulations[11] are enforced in New Jersey by the Department of Labor and Industry concerning labels which must be placed on containers holding substances that constitute a health, poison or other hazard.

The prescribed legend for such labels is similar to that described under the *State of Illinois.*

The regulations include tables to describe the exact wording which must appear on labels for various types of chemicals such as those which give toxic vapors, skin irritants, etc.

In addition, specific labeling information is given for 46 chemicals, and it is recommended that reference be made to the basic regulation itself.

In the State of New York[12] the Department of Health has issued requirements for warning labels to be placed on containers of hazardous substances. The subject matter of these labels is similar to that described under the State of Illinois. The regulations include a table of required statements of hazard, precautionary measures and instructions to be observed in case of contact or exposure.

In the case of Ohio only brief mention is made in the General Code[13] as to required labels for paints which may be injurious to health. The label must show the names of any substances "used in quantities sufficient to be dangerous or injurious to human life or health, whether through absorption, contact or inhalation." The regulation is enforced by the State Department of Agriculture.

The Texas Penal Code is the only one to specifically prohibit the sale of any mixture for household use that contains more than one per cent of thallium. In addition, it provides that similar data be given on the label as described under the Illinois regulations in the case of the substances intended for household use which may be termed hazardous. The Act[14] is enforced by the Commissioner of Health.

The Department of Labor and Industries and the Department of Public Health administer regulations[15] in Massachusetts regarding labels to be affixed to receptacles containing hazardous materials. Preparations which include the following chemicals in excess of the percentages by weight specified must be so labeled: Benzol 3%; Carbon Tetrachloride, 5%; Carbon Disulfide, 5%; Inorganic Cyanides, 1%; Methyl Bromide, 5%; Tetrachloroethane, 2%; Beryllium Oxide, 1%. For each of these, illustrative wording to be placed on the label is given.

In Oregon caution labels are required[16] by the State Board of Health on all containers of hazardous chemicals. No specific chemicals are mentioned; however, for additional information, attention is directed to "A Guide for the Preparation of Warning Labels for Hazardous Chemicals" adopted by the Manufacturing Chemists Association of the United States."[17]

### *Federal Acts*

The Federal Caustic Poison Act,[18] enforced by the Food and Drug Administration, and applying to Interstate Commerce, requires that any materials containing chemicals in excess of certain percentages be labeled with (1) the common name of the substance: (2) the manufacturer's name; (3) the word "poison" in letters of a specified size; and (4) directions for treatment. The chemicals and percentages listed are as follows: hydrochloric acid, 10%; sulfuric acid, 10%; nitric acid, 5%; carbolic acid, 5%; oxalic acid, 10%; any salt of oxalic acid, 15%; acetic acid, 20%; hypochlorous acid, 10% available chlorine: potassium hydroxide, 10%; sodium hydroxide, 10%; silver nitrate, 5%; ammonia water, 5%. The regulations list acceptable antidotes for the chemicals covered by the Act.

### *Other U. S. Regulations*

It may be safely assumed that other states and municipal governments will in the future enact legislative codes designed to protect the consumer from various types of health hazards. Probably the best way for a manufacturer to keep informed regarding this subject is to subscribe to an expanding loose leaf notebook[19] published by the National Paint, Varnish and Lacquer Association. The notebook is supplemented from time to time with pages describing new laws as they come into being.

### *Foreign Regulations*

It is not within the scope of this article to explore the legislation of the many foreign countries to which American paint manufacturers might export their products. As stated at the outset of this article, generally speaking, the United States leads the world in health laws and regulations. Thus, if a manufacturer adheres to these laws he will be reasonably safe in the foreign field.

We would however like to call the readers' attention to the preliminary draft of a Latin American Food Code,[20] prepared last year. This Food Code bears no legal authority as yet but has been promulgated with the thought in mind that it would become a pattern for all Latin American countries to follow in formulating their individual health laws. In this sense, then, it bears great significance. From March 28th to April 3rd of this year, the VII Latin American Congress of Chemistry was held in Mexico City, and several sessions were set aside to discuss the various ramifications of this Food Code.

Chapter XIX of the Food Code deals with the subject of Household Goods, and one of the articles in this Chapter reads as follows (English translation from the Spanish):

"Paints for inner walls of drinking tanks must not contain free acids or alkalies. Their stability against light must be practically perfect, as also their stability against alkalies and acids, and they may not contain toxic substances, lead, mercury, etc., or any product capable of imparting any smell or taste to the water."

Another article of this Food Code requires that toys and other items used by children should be free from injurious mineral dyes "containing antimony, arsenic, copper, mercury, more than 1% of lead, uranium, cyanides and soluble barium, cadmium, chromium and zinc salts." Also prohibited are "organic dyes such as picric acid, dinitrocresol, metanil yellow, orange II, aurin (corallin), and any other synthetic dyes having a toxicity equivalent to those listed above."

The article, in addition, specifies that "mouthpieces of bugles, horns and all other wind instruments, as well as the portion of harmonicas contacted with the lips, shall contain no lead, zinc or other substance considered to be harmful."

From the above it may be seen that potentially this Code, if adopted by Latin American countries, could become one of the most all-encompassing single pieces of health legislation promulgated anywhere in the world. It would be well for those manufacturers who export their products to Latin America, or who have manufacturing establishments there, to watch future development with regard to this Code.

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## ACID COPPER DEPOSITS

(*Continued from page* 67)

furic acid (based on the thiourea consumption of 0.0012 gram/ampere-hour); 2,6-2,7-naphthalenediacid was added in the form of a 50% aqueous solution (0.06 gram/ampere-hour).

The bath was adjusted after each removal of components. When the desired brightness was not obtained following each adjustment, an excess of brighteners was added — 0.25 gram more of thiourea and 12.5 grams more of naphthalenediacid.

Since the solution temperature increased during operation, steel coil pipes 13 mm. in diameter and covered with lead 4-5 mm. thick were installed to cool the bath to 12-20°C. (54-68°F.). The surface area of coil in each bath, 2.9 sq. m. (31 sq. ft.) was sufficient to maintain the temperature constant. The required temperature can also be maintained by agitating the bath with cold compressed air. However, in this case, the thiourea adjustments should be twice as frequent as with the mechanical cathode agitation.

During operation, the electrolyte was filtered 4-5 times a day for 30 minutes each time. The plating solution was pumped, by means of the compressed air, into a separate tank equipped with a cloth filter. The filtering installation efficiency (Fig. 2) was 200 liters/hour (53 gallons/hour). To prevent contamination from anodic particles, the anodes were placed in cloth bags. Both the anodes and the bags were washed once a day.

Under industrial conditions, depletion of copper sulfate in the electrolyte took place mostly due to solution dragout. To provide automatic replenishment, cloth bags filled with copper sulfate were placed in the tank.

A four-month industrial experience indicated that a copper coating 15-20 microns (0.0006-0.0008") thick can be deposited in 20-25 minutes. The brightness of deposits from the electrolytes employing brighteners is not inferior to mechanically polished coatings. The brightness of nickel plated over the bright copper deposits is higher than that of bright nickel deposited on the chemically brightened or mechanically polished copper undercoating.

The method of plating bright copper, presently used at the aforementioned Russian mechanical plant exclusively, produced a considerable increase in the plant's efficiency and allowed reduction of the number of copper plating tanks from sixteen to four.

# Science for Electroplaters

## 50. Copper Plating - II.

By L. Serota

### *Leveling*

THE effect of addition agents on leveling in acid copper solutions was the subject of study by F. I. Nobel and B. D. Ostrow. Results indicate that leveling effect is possible, without regard to the roughness of the basis metal surface, by the use of certain specific addition agents. The significance of this development is reflected in the wider application of the acid copper bath, since such a solution, capable of producing a bright deposit as well as exhibiting high leveling characteristics, could possibly reduce or eliminate polishing operations of the basis metal and permit direct bright nickel plating on the copper, a decidedly economic advantage. In that respect, J. F. Beaver reported in 1949 that many zinc die castings were being plated with bright acid copper, exhibiting pronounced leveling action.

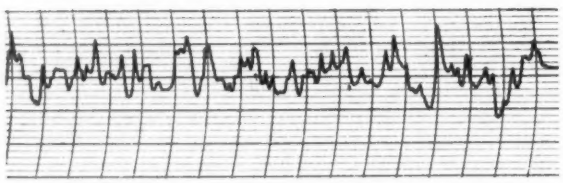
The solution used for the Nobel-Ostrow investigation consisted of 28 oz./gal. copper sulfate and 7 oz./gal. sulfuric acid. Test runs were made at a temperature of 95°F. with vigorous agitation, at current densities of 25 and 50 amp./ft.$^2$ When 1 g./l. (0.013 oz./gal.) of phenol-sulfonic acid was added to the copper solution, a panel plated at the indicated conditions of temperature and agitation, and at a current density of 25 amp./ft.$^2$ gave a smoother and harder deposit, with little brightness, than that obtained without the addition agent. The copper solution containing the phenolsulfonic acid was allowed to age for 3 days before use.

Leveling was positive, with a reduction in RMS of 8.50 and in the frequency factor of 20. Leveling measurements were made by the surface analyzer method, with readings recorded by a direct inking oscillograph. Fig. 199 is is graphical representation of the values obtained by the oscillograph before and after plating with the acid copper solution containing phenolsulfonic acid as a moderate leveler.

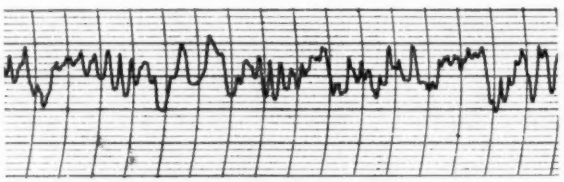
Glue was also studied for leveling effect. When 0.003 g./l. was added to the copper solution, a panel plated at 95°F., 25 amp./ft.$^2$, agitated, gave a semibright smooth deposit with increased hardness. This addition agent also gave positive leveling with an RMS reduction of 12 μ in. and a reduction in frequency factor of 23, indicating good leveling agent characteristics. The effect is shown graphically in Fig. 200. Caution, it is advised, must be exercised in the use of glue, since control is difficult in view of the small quantities required. In addition, hydrolysis of glue by the acid, giving lower protein and amino acids, may result with the accumulation of such products in the bath a possible cause of difficulties. An excess of glue will make the deposit porous and brittle.

A combination of 0.01 g./l. thiourea as brightener and 0.02 g./l. molasses as addition agent, when added to the standard solution, gave a more uniform deposit and better leveling than that obtained with thiourea alone with panels plated at 95°F., 25 amp./ft.$^2$, vigorous agitation. Higher current densities did not give as satisfactory leveling results. With an increase, however, of molasses to 0.1 g./l., the molasses-thiourea mixture gave moderate leveling at a current density of 50 amp./ft.$^2$ The reduction in RMS was 6 and the frequency factor was reduced by 18. The additional amount of molasses added seemed to provide improved ductility.

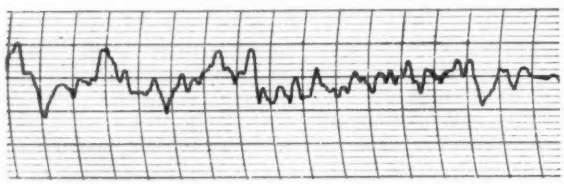
With 0.01 g./l. dextrin plus 0.075 ml./l. of a proprietary low foaming wetting agent added instead of molasses, to 0.01 g./l. thiourea, a panel plated at 95°F., 50 amp./ft.$^2$ with vigorous air agitation gave a brighter deposit than that obtained with thiourea alone or the thiourea mixture. The RMS was reduced by 4μ in. and



*Before plating: average RMS 17.5, frequency factor 46, RMS range 13–23*



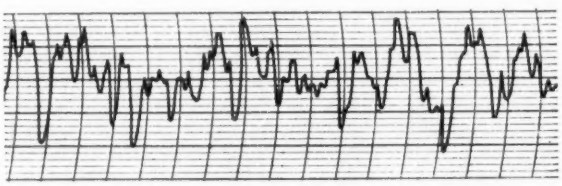
*Before plating: average RMS 22.5, frequency factor 45, RMS range 14–19*



*After plating: average RMS 16, frequency factor 35, RMS range 10–25*

*Reduction in RMS 1.50, reduction in frequency 11*

*25 asf*

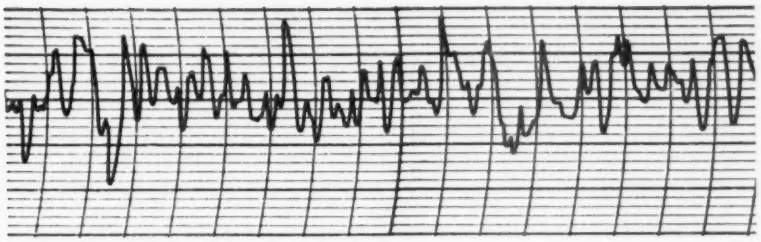


*After plating: average RMS 38, frequency factor 40, RMS range 25–56*

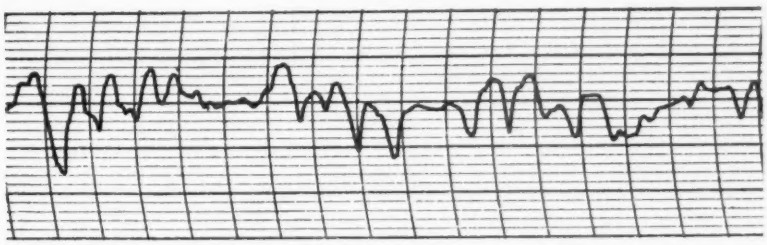
*Reduction in RMS –15.50, reduction in frequency 5*

*50 asf*

Fig. 199. Effect of current density on leveling in the standard acid copper solution. Copper sulfate, 28 oz./gal.; sulfuric acid, 7 oz./gal.



*Before plating: average RMS 32.5, frequency factor 45, RMS range 20–44*



*After plating: average RMS 24, frequency factor 25, RMS range 18–32*

*Reduction in RMS 8.50, reduction in frequency 20*

Fig. 200. Effect on leveling of phenolsulfonic acid, 1.0 g./l., in the acid copper solution at 25 asf.

the frequency factor was reduced by 23 units.

It was observed that a fresh solution of thiourea gave a brighter plated surface and exhibited better leveling than that obtained with solutions allowed to stand. This condition was attributed to the hydrolyzing action of thiorea in acid solutions, with decomposition rate increasing at higher temperatures. The equation for the hydrolysis of thiourea is as follows: $NH_2CSNH_2 + 2H_2O \rightarrow 2NH_3 + CO_2 + H_2S$.

Leveling is considered by A. H. DuRose and associates as a process entailing reduction of the surface roughness of a basis metal or the metal deposit. This may be accomplished by (a) mechanical methods such as cold rolling, polishing, buffing, or tumbling with burnishing media; (b) electropolishing or periodic reverse current plating; (c) plating.

Ostrow and Nobel attribute leveling in plating solutions principally to the polarization differences between elevations and depressions in a metal surface, a mechanism based upon deposition potential of the metal plated and polarization (around a scratch) at the cathode, due to the presence of the addition agent. The effect of this condition, a greater potential difference between the anode and recessed portion of the scratch compared to that between the anode and the elevated part, will result in a filling-in process of the scratch, a leveling effect. This ratio between the potential differences (for scratch) and deposition potential which, for the acid copper, is considered high since a low deposition potential is sufficient, accounts, the authors contend, for the good leveling characteristics of this bath.

The diagrammatic representation, Fig. 201, indicates that leveling occurs when $e_3 + \Delta e$ exceeds $e_3$. In this figure $e_1$ is the potential difference of the top of the scratch, $e_2$ the potential at the bottom of the scratch, and $\Delta e$ represents the potential difference between $e_1$ and $e_2$.

### *Leveling Measurement*

In evaluating surface smoothness of electrodeposited or electropolished surfaces, fixed terms have been adopted as a standardization procedures for the measurement of surface variations. Thus, H. L. Kellner indicates "waviness" for scratches or marks on a metal surface more than 1/32 inch (0.8 mm.) apart and "roughness" where scratches show markings closer than 1/32".

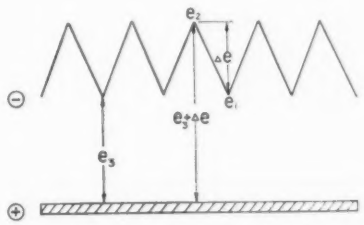



Fig. 201. Potential difference between anode and surface and base of scratches on cathodes.

The following methods are used for determining the number of scratches in a surface (surface smoothness): (a) microscope, (b) microinterferometer, (c) electro-mechanical tracer instruments, (d) electron microscope.

For the microscopic method, a photomicrograph taken at right angles to the surface indicates the number of scratches but not the depth for a given area. Magnification is usually below 100x, thereby permitting a wide area coverage. A modification of this procedure, wherein the depths or irregularities of the surface can be determined, is the microscopic examination and measurement of a carefully prepared (polished) cross-sectional view or profile of the metal surface. A favorable aspect of this method is the fact that the photomicrographs can be saved for reference.

The microinterferometer, or interference microscope, indicates surface irregularities by producing interference fringes which result from light interterence (Newton rings) when a beam of light is directed upon irregular (non-parallel) surfaces. Measurements can be made, according to A. G. Strong and F. Ogburn, for surface irregularities ranging from 2 to 80μ in. (0.05-2μ) with a highly reflected surface. Advantages noted for this instrument include an exact peak to valley measurement for a small surface; a close estimate of an RMS value from the image; reproducibility for a given area; the avoidance of physical contact between the surface measured and the instrument. Compared to the tracer type surface analyzer, the range by this method is limited. This method would also require destruction of the sample for internal measurements.

Electro-mechanical tracer instruments provide a comparative method for surface measurements, wherein acceptable numerical values are made available in specifications for surface smoothness. Measurements are made by drawing a hard tracer tip, usually diamond, over the surface to be measured, with the vertical motion of the tip converted into recorded electrical im-

(*Continued on page 75*)

# SHOP PROBLEMS

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METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

### Finishing Aluminum Castings

*Question:* I am enclosing an aluminum fence post casting. You will notice that it has received some type of brightening treatment. I would like to know what this treatment is called, how it is done, what type of equipment is used, and how long it takes. We intend to set up equipment to do this on a production basis.

H. R. B.

*Answer:* The aluminum casting does not appear to have any other treatment except barrel tumbling.

Equipment, media, and compounds for barrel finishing aluminum are offered by a large number of companies, a list of which will be found in the METAL FINISHING GUIDEBOOK-DIRECTORY. Many of these suppliers have pilot plants and laboratories, where they can process samples and determine the best materials and procedures to employ in order to obtain the desired finish.

### Grey Finish on Nameplates

*Question:* We would appreciate information as to how the enclosed nameplate has been finished. A small section on the top, the darker shade of grey, has been removed with thinner for our own study purposes.

You will notice that the grey is light on the highlights and blends into a dark grey at the edges, which makes the nameplate look very attractive. If it is a special lacquer or enamel, we would like to know the source of supply.

O. F.

*Answer:* The nameplate is bright aluminum, finished with a tinted lacquer, which has been wiped off the highlights very lightly. Any large lacquer supplier should be able to furnish suitable dyes for the finish.

### Spray from Zinc Plating

*Question:* Will you please send us some information regarding the danger of zinc poisoning or respiratory damage due to spray or fumes from a zinc cyanide bath operated at current densities of 15 to 30 amp./ft.$^2$ with no ventilation system installed? Are the fumes which sting the eyes also carrying zinc into the lungs? The employees are working approximately ten feet from the tank. Also, is a duct necessary?

R. H. B.

*Answer:* The spray evolved from zinc plating will contain in addition to zinc, caustic and cyanide, which will affect the mucous membranes.

Many state health departments require local ventilation on this type of tank and, even if your state authorities do not insist, an exhaust duct would be desirable if the tank operators are being affected.

### Buffing Gold Plate

*Question:* We plate copper and brass with gold but I cannot get a buffable plate. When I put several copper medals on a wire and leave them in the gold solution for 10-20 minutes the backs are satisfactory but, as soon as I buff the letters, the copper shows through. How can I get a plate I can buff? My solution contains ½ oz. potassium gold cyanide and 1½ oz. potassium cyanide to 1 gal. distilled water.

E. S.

*Answer:* In order to obtain sufficient thickness of gold deposit to take the buffing operation without cutting through, it is necessary to plate longer at a very low current density, not more than about 1 amp./sq.ft. in your dilute solution. Increasing the metal content to 1 oz./gal. will permit more rapid plating, but the current density must be low enough so that the deposit is a clear, uniform mat, and not spongy.

For heavy, hard deposits, suitable for subsequent buffing, you should use one of the proprietary baths which have been developed especially for the purpose. A list of suppliers will be found in the METAL FINISHING GUIDEBOOK.

### Gold-Dye Brass Lacquer

*Question:* We shall greatly appreciate your sending any information relating to "gold lacquering of brass."

C. G. G.

*Answer:* Two methods are employed. In one, the gold dye is mixed into the lacquer prior to application. This is the convenient method but, on large surfaces, the color will vary slightly due to differences in thickness of lacquer film over the surface.

The other method is to dip the lacquered part into a suitable dye solution, after which it is rinsed and dried. The dye absorption will be uniform over the surface, even though the lacquer film may be of non-uniform thickness, but extra operations are required.

Dyes for both purposes are obtainable from most lacquer suppliers.

### Current Capacity of Cable

*Question:* Can you furnish us with the correct information as to the proper welding cable size to carry 500 Amp. from rectifier to plating tank. The distance between tank and rectifier is 30 feet.

A. A. C.

*Answer:* The proper size cable will be 500,000 circular mills, which has a cross-sectional area of 0.5 inch. Welding cable will probably be more expensive than the usual electrical cable of the same capacity. The latter, although not as flexible, will also be suitable. Instead of the 500,000 circular mil cable, two cables of 250,000 circular mils each can be used for ease of installation.

### Pickling Inhibitors

*Question:* We are interested in etch inhibitors or alternate methods of eco-

nomically removing a light rust from steel stampings prior to brass plating, without the need of removing the inhibitor with an alkaline cleaner. At the present time we are using an inhibitor in sulfuric acid.

N. J.

*Answer:* A number of suppliers offer acid pickling inhibitors which are claimed to be free-rinsing, and a list will be found on page 703 of the 1959 edition of the METAL FINISHING GUIDEBOOK-DIRECTORY.

For removal of light rust from steel an inhibitor may not be necessary. At room temperature, muriatic acid should be satisfactory for the purpose.

### Licorice in Tin Baths

*Question:* I have been interested in getting whiter deposits from a tin fluoborate bath. I ran through your 1959 GUIDEBOOK and, from that, using licorice root powder or its equivalent would do this for me. As yet I have been unable to find anyone who sells this powder. This information was on page 408 of your 1959 book. Can you tell me where I can purchase licorice root powder or its equivalent, and what its equivalent would be? Also, would like to know about mixing same and what additions would be necessary for a 200 gallon bath?

H. E. D.

*Answer:* Licorice root powder and extracts are obtainable from pharmaceutical, confectionery, and some of the large laboratory supply houses. One gram per liter of powder or the extract of its equivalent is used, which would correspond to about 1½ lbs. to the tank.

## SCIENCE FOR ELECTROPLATERS

(*Continued from page 73*)

pulses. The Profilometer and Brush Surface Analyzer are tracer type units commonly used.

The Profilometer is adaptable for field surface measurements with numerical values interpreted in terms of root mean square (RMS) average micro-inches. The disadvantage, H. L. Kellner notes, in the use of this instrument is that profile records are not made.

With the Brush Surface Analyzer measurements of surfaces ranging from 0.5 to .125μ in. (0.013 to 3μ) RMS can be recorded on a chart as a profile curve. A direct inking magnetic oscillograph is used for the recording. Such recordings are indicated in the graphs in figures 199 and 200. The Brush Surface Analyzer provides a means of obtaining a record which can be saved, but the profile curve obtained with this instrument indicates an exaggerated rough surface, with the heights of the imperfections much greater than the widths.


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# Patents

## RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD

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### Pickling Titanium

*U. S. Patent* 2,861,015. *Nov.* 18, 1958. *R. A. Simon, assignor to North American Aviation, Inc.*

The method of descaling a titanium workpiece comprising the steps of immersing such a workpiece in a scale conditioning bath comprised of an aqueous solution of from about 40 to about 55 weight percent sodium hydroxide, from about 1 to about 1½ weight percent of a compound selected from the class consisting of sodium chromate, sodium dichromate, potassium chromate, potassium dichromate, and chromium trioxide, and the balance being water, maintained at substantially 270°F., and subsequently immersing said workpiece in an acid bath for removing the scale therefrom.

### Chromate Coating Magnesium

*U. S. Patent* 2,861,019. *Nov.* 18, 1958. *H. K. De Long, assignor to The Dow Chemical Co.*

In a method of producing a coating on an article composed of at least 85 percent magnesium, the step which consists of subjecting the article, for a period of between 1 and 5 minutes, to the action of an aqueous solution at a pH between 0.9 and 1.8 containing as effective constituents based upon the weight of the solution between about 0.25 and 3.0 percent of chromium trioxide and a sulfate selected from the class consisting of ammonium, hydrogen and alkali metal and alkaline earth metal sulfates in an amount sufficient to provide the chemical equivalent $SO_4$ group corresponding to the sulfate fraction contained in 0.1 to 3.0 percent ammonium sulfate.

### Gold Plated Printed Circuits

*U. S. Patent* 2,861,029. *Nov.* 18, 1958. *L. A. Bain, Jr. and R. A. Geshner, assignors to Western Electric Co., Inc.*

The method of making a printed wiring board having gold-plated terminal portions, comprising bonding metal foil onto one side of a phenol-fiber board with an adhesive, depositing a resist on the foil in a pattern exposing the terminal portions to be gold-plated, immersing the board in a gold-plating solution caustic to the adhesive, electroplating a layer of gold onto the exposed terminal portions, removing the board from the solution, removing the resist to expose the metal foil and the gold-plated terminal portions, depositing resist onto the metal foil to cover the gold-plated terminal portions and other portions of the foil defining a predetermined circuit pattern, etching away the metal foil not covered by the resist to leave said predetermined circuit pattern with its goldplated terminal portions, and removing the resist from the gold-plated terminal portions and the predetermined circuit pattern.

### Thixotropic Coating Compositions

*U. S. Patent* 2,861,048. *Nov.* 18, 1958. *H. J. Wright, D. R. McGuire and P. F. Westfall, assignors to Cook Paint & Varnish Co.*

The process for making a thixotropic product which comprises dispersing a polyamide having a molecular weight not in excess of 1500 and comprising the heat reaction product of polymeric polyene fat acids, an alkylene polyamine having at least two primary amino groups, and from 20 to 60% by weight, of the total weight of all ingredients of a long chain monomer fatty acid having at least six carbon atoms, in a paint vehicle selected from the group consisting of alkyd resins, drying oils and resin acid esters at a temperature below the softening point of said polyamide.

### Device for Coating a Traveling Sheet

*U. S. Patent* 2,861,541. *Nov.* 25, 1958. *L. Hornbostel, assignor to Beloit Iron Works.*

In a device for coating a traveling sheet, a tank maintaining a level of liquid coating bath therein, an applicator roll mounted on the tank partially submerged in the coating bath and rotating in the direction of sheet travel to apply a coating to one side thereof, a doctor roll rotating oppositely to the direction of sheet travel and positioned on said tank on the same side of the sheet behind said applicator roll in the direction of travel of said sheet for contacting and for wiping excess coating from the sheet, a flexible shoe pivotally mounted on said tank and defining with said doctor means a nip receiving the traveling sheet, and diaphragm means resiliently urging said shoe against the sheet throughout the full width thereof to control the extent to which excess coating is wiped from the sheet.

### Steam Cleaner

*U. S. Patent* 2,861,838. *Nov.* 25, 1958. *W. K. Wyatt and G. E. Tradewell, assignors to Turbo Machine Co.*

In a spray cleaning machine, a pipe coil and electric heating means therefor; a reservoir for cleaning fluid; a conduit for conducting the fluid from a pressure supply source to the reservoir; a motor-driven pump for drawing fluid from the reservoir and introducing it into one end of the coil; a delivery hose connected to the other end of the coil and provided with a spray nozzle; a float-controlled valve for maintaining a constant level of fluid in the reservoir; and a switch means automatically operative upon exhaustion of the fluid in the reservoir in the event of failure of the supply source, to interrupt current flow to the electric heating means and to the motor.

### Rust Preventive Primer

*U. S. Patent* 2,861,892. *Nov.* 25, 1958. *F. J. Radd, D. A. Shock and J. D. Sudbury, assignors to Continental Oil Co.*

A coating composition adapted for use as a corrosion inhibitor comprising a bitumastic primer (cold dip) consisting of petroleum tar, rosin, gilsonite, and solvent naphtha in the approximate ratio of 28, 1, 9, and 62 percent, respectively, and from 0.002 to 0.1 part of a sulfonate per 100 parts of said primer wherein the cation of said sulfonate is organic.

### Solvent-Coating Process

*U. S. Patent* 2,861,897. *Nov.* 25, 1958. *P. R. Hendrixson, assignor to E. I. du Pont de Nemours & Co.*

The method of applying a film-like organic coating to the surface of an article which comprises providing (1) a body of a liquid composition including a volatile solvent and a film-forming organic material dispersed therein, said

solvent being substantially inert to the film-forming organic material, and (2) a spray zone in fluid communicatioon with said body for retaining the vapors of the solvent; maintaining said liquid composition at its boiling temperature; condensing solvent vapors in the spray zone and returning the condensed solvent to the body of liquid; preheating the article to be coated to a temperature at least equal to the boiling point of the solvent; spraying said article in the spray zone with said liquid composition, the heat within the article evaporating the solvent as the composition is applied; and withdrawing the article from the spray zone substantially solvent-free but coated with said film-forming organic material.

### Conversion Coating

*U. S. Patent* 2,861,906. *Nov.* 25, 1958. *L. K. Schuster and A. L. Baldi, assignors to Kelsey-Hayes Co.*

In a method of coating corrodible ferrous metal by first etching the metal surface in aqueous nitric acid having a concentration of from 1 to 20% by weight for a period of from 2 to 70 seconds to a temperature of 60 to 150°F., and then applying to the etched surface a film of an in situ dried aqueous solution of partially reduced chromic acid, at least about half but less than all the chromic acid in the film being reduced, the improvement by which the etching is preceded by a step in which the metal surface is subjected to an activation treatment to minimize passivation by the nitric acid.

### Conversion Coating

*U. S. Patent* 2,861,907. *Nov.* 25, 1958. *T. A. Butler, assignor to The Lubrizol Corp.*

The process of inhibiting corrosion of metal surfaces which comprises applying to said surfaces a film of a polyvalent metal salt of a phosphorodithioic acid prepared by the process which comprises (*a*) the reaction of a mixture of a monohydric alcohol and from 0.25 to 4.0 equivalents of a polyhydric alcohol, with a phosphorus sulfide to form a phosphorodithioic acid, and (*b*) conversion of said acid to a polyvalent metal salt thereof.

### Carbonate Removal from Cyanide Baths

*U. S. Patent* 2,861,927. *Nov.* 25, 1958. *M. Ceresa and J. R. Crain, assignors to Westinghouse Electric Corp.*

In the process of plating articles in an aqueous alkali cyanide electrolyte plating bath containing at least 0.5 ounce per gallon of alkali hydroxide in which excess carbonate builds up and in which deficiencies of free alkali metal cyanide and alkali metal hydroxide develop during use, which process includes the step of returning the electrolyte dragout to the bath, the improvement which comprises adding to the aqueous electrolyte a composition consisting essentially of from 9% to 91% by weight of calcium cyanide and from 91% to 9% by weight of calcium dioxide, said composition being added in an amount sufficient to precipitate the excess carbonate, there remaining at least about 4 ounces per gallon of carbonate in the electrolyte, and increase the free alkali metal cyanide and alkali metal hydroxide to a desired predetermined level, said composition maintaining the pH of the electrolyte at a level of at least 0.5 ounce per gallon of alkali hydroxide.

### Carbonate Removal from Cyanide Baths

*U. S. Patent* 2,861,928. *Nov.* 25, 1958. *M. Ceresa and W. L. Bohman, assignors to Westinghouse Electric Corp.*

In the process of treating an aqueous alkali copper cyanide electrolyte having an excess of carbonate, containing organic impurities and having a deficiency of free alkali metal cyanide, the improvement which comprises adding to the aqueous electrolyte a composition comprising from 85% to 5% by weight of calcium cuprous cyanide, from 5% to 45% by weight of calcium cyanide, and from 10% to 50% by weight of calcium oxide, the composition being added in an amount sufficient (1) to react with only the excess of carbonate to form a precipitate of calcium carbonate, there remaining at least about 4 ounces per gallon of carbonate in the electrolyte, and (2) to provide additional free alkali metal cyanide to remedy the deficiency thereof, said composition maintaining the pH of the aqueous electrolyte at a level of not over substantially 16 ounces per gallon of alkali hydroxide to promote the rapid settling of the calcium carbonate precipitate in the form of a mass of relatively coarse easily filterable particles which precipitate occludes the organic impurities in the electrolyte, agitating the electrolyte and the added composition until the precipitate-forming reaction is substantially complete and separating the treated electrolyte from the precipitate.

### Bright Copper Bath

*U. S. Patent* 2,861,929. *Nov.* 25, 1958. *D. Martin and A. H. Parker, assignors to E. I. du Pont de Nemours & Co.*

The process for electroplating copper which comprises electrodepositing copper from an aqueous copper cyanide solution, said solution containing between 0.025 to 0.5 grams per liter of an alkali metal salt of methylene-bis-*a*-naphthalene sulfonic acid and between about 10 and 250 p. p. m. by weight of selenium as a compound selected from the group consisting of selenates and selenites, and additionally between about 0.01 to 0.1 p. p. m. by weight of selenium as a selenide compound, subjecting said solution to a reverse current cycle of between 10 to 120 seconds' duration wherein the forward current period is at least twice as long as the reverse current period.

### Electropolishing Solution

*U. S. Patent* 2,861,930. *Nov.* 25, 1958. *H. B. Robinson, assignor to A. O. Smith Corp.*

The method of electropolishing metallic material selected from the group consisting of the 200 series of stainless steel, the 300 series of stainless steel, the 400 series of stainless steel, carbon steel, nickel and nickel base alloys, and cobalt and cobalt base alloys which comprises passing an electric current from said metallic material as the anode through an aqueous solution of a mixture of ortho phosphoric acid, a salt of alginic acid and a mineral acid selected from the group consisting of sulphuric acid and hydrochloric acid, and derivative of alginic acid being present in an amount of about 0.1% to 5.0% by weight of said solution.

### Plating Process

*U. S. Patent* 2,861,936. *Nov.* 25, 1958. *D. W. Colasanto, assignor to Radio Corp. of America.*

Apparatus for coating by electrodeposition connector wire portions extending from one face of a disc type stem assembly.

### Electropolishing Method

*U. S. Patent* 2,861,937. *Nov.* 25, 1958. *J. F. Jumer.*

Apparatus for electropolishing the internal end and side wall surfaces of a vessel which is symmetrical about an axis of revolution and adapted to contain an electropolishing solution.

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### Emulsifiable Rust Preventive Concentrate

*U. S. Patent* 2,862,825. *Dec.* 2, 1958. *R. A. Westlund, Jr. and C. E. Paxton, assignors to Esso Research and Engineering Co.*

An emulsifiable rust preventive composition that forms a stable emulsion when admixed with 1 to 10 parts of water, consisting essentially of from 72.0 to 95.0 wt. percent of a base material, from 1.0 to 10.0 wt. percent of a coupling agent, and from 1.0 to 18.0 wt. percent of a balancing agent.

### In Situ Polyamide Coating Method

*U. S. Patent* 2,862,836. *J. C. D. Oosterhout, assignor to The Texas Co.*

A method of protecting a body comprising applying to a surface thereof a layer of a salt of the formula $H_2NCH_2RCH_2NH_2 \cdot HOOCCH_2'RCH_2COOH$ derived from the reaction of a diamine of the formula

$$H_2NCH_2RCH_2NH_2$$

and a dicarboxylic acid of the formula

$$HOOCCH_2R'CH_2COOH$$

in which R and R′ are divalent hydrocarbon radicals free from olefinic and acetylenic unsaturation and in which R has a chain length of at least two carbon atoms, and then converting said salt in situ to the corresponing polyamide by heating said salt to a temperature of 80-300°C.

### Descaling Refractory Metals

*U. S. Patent* 2,862,839. *Dec.* 2, 1958. *E. C. McHenry, assignor to Allegheny Ludlum Steel Corp.*

In apparatus for removing oxides from strip material formed from refractory metal selected from the class of titanium, titanium base alloys, zirconium and zirconium base alloys, the combination of, a tank adapted to contain a molten alkali metal caustic bath for reacting with the oxides on the strip, an immersion roll at least partially below the top of the tank and adapted to be at least partially immersed in said bath and in contact with the strip for holding the strip immersed therein, an idler roll partially below the top of the tank and adapted to be at least partially immersed in said bath out of contact with the strip, means for effecting rotation of the idler roll and means for cooling the rotating idler roll to a temperature substantially less than the temperature of the immersion roll, the cooled idler roll cooperating in said bath to preferentially attract and receive metal oxides removed from the strip in said bath to thereby maintain the immersion roll substantially free from said metal oxides.

### Vitreous Enameling

*U. S. Patent* 2,862,841. *Dec.* 2, 1958. *L. M. Bernick, H. M. Roelofs and J. E. McFarland, assignors to Inland Steel Co.*

A process for preparing an iron or steel base for vitreous enameling so as to obtain satisfactory enamel adhesion with a single cover coat of a light colored vitreous enamel applied directly to the base, said process comprising the steps of providing on the surface of the metal base a coating comprising at least one oxide selected from the group consisting of titanium, antimony, and tungsten oxides, and heating the oxide coated base in a substantially non-oxidizing atmosphere to a temperature at which reduction of the oxide by reaction with the iron in said base occurs.

### Vitreous Enameling

*U. S. Patent* 2,862,842. *Dec.* 2, 1958. *L. M. Bernick, H. M. Roelofs and J. E. McFarland, assignors to Inland Steel Co.*

A process for preparing an iron or steel base for vitreous enameling so as to obtain satisfactory enamel adhesion with a single cover coat of a light colored vitreous enamel applied directly to the base, said process comprising the steps of providing on the surface of the metal base a coating comprising molybdenum oxide, and heating the oxide coated base in a substantially non-oxidizing atmosphere to a temperature at which reduction of the oxide by reaction with the iron in said base occurs.

### Cadmium Electroplating

*U. S. Patent* 2,862,860. *Dec.* 2, 1958. *P. N. Vlannes, S. W. Strauss and B. F. Brown.*

In the electrodeposition of cadmium from aqueous bath, the improvement which comprises electrodepositing cadmium from a cyanide-free aqueous ammoniacal bath of pH up to about 1 1.2 in which is dissolved an alkyl monoaminomonocarboxylic acid of from 2 to 5 carbon atoms and a cadmium salt in a molar ratio of from about 1:1 to 2:1.

### Paint Spray Masks

*U. S. Patent* 2,863,384. *Dec.* 9, 1958. *E. L. Rich.*

A spray shield for masking out cer-

tain areas of an indented, configured, portion of a surface, which portion includes areas at different levels, comprising; a very thin, ductile sheet for mounting on said surface over said areas, with portions of said sheet drawn into the depressed areas so that said sheet presents an indented surface with areas at different levels conforming to said portion of the first mentioned configured surface, said latter portions being stiff and having a cold working developed resiliency which returns them to said indented shape if they become dented or bent; said sheet having openings therein conforming to certain areas of said surface which are to remain exposed.

### Bright Copper Bath

*U. S. Patent* 2,862,861. *Dec.* 2, 1958. *P. W. Moy, assignor to The Harshaw Chemical Co.*

A copper plating solution comprising an aqueous solution of copper cyanide, free cyanide of the class consisting of potassium and sodium cyanides and an added thio-substituted six-member heterocyclic ring compound in an amount from about 0.05 gram per liter to about 10 grams per liter.

### Molten Salt Bath Cleaning

*U. S. Patent* 2,863,465. *Dec.* 9, 1958. *R. H. Shoemaker and J. A. Faler, assignors to Kolene Corp.*

A molten salt bath apparatus for cleaning metals of surface impurities comprising a pot having a work zone and having to one side of said work zone a settling basin, with said work zone and settling basin being relatively separated and barriered, heater tubes in said work zone and settling basin, means in the work zone for agitating said bath and for pumping said bath from said work zone to said basin, and an overflow means for permitting overflow from said basin to flow over it back to said work zone, and mechanical means for removing from said basin impurities settled therein as a sludge.

### Acid Inhibitor

*U. S. Patent* 2,863,780. *Dec.* 9, 1958. *J. C. Ball, Jr., assignor to West Virginia Pulp and Paper Co.*

A process for inhibiting the corrosion of iron in acid solutions, which consists essentially in the addition to the acid solution of a small amount of a lignin amine.

### Oxalate Conversion Coating

*U. S. Patent* 2,863,791. *Dec.* 9, 1958. *P. de Cerma, assignor to Montecatini.*

The process of forming oxalate coatings on iron and steel which comprises applying to the body to be coated an aqueous solution of oxalic acid and sodium nitrite, and maintaining the nitrite ion concentration between 0.2 and 4 grams per litre.

### Cold Phosphating

*U. S. Patent* 2,863,793. *Dec.* 9, 1958. *P. de Cerma, assignor to Montecatini.*

The method of maintaining the efficiency of phosphate coating baths used to coat a metallic surface in the cold, comprising preparing, as coating bath, an aqueous solution of zinc phosphate and at least one nitrate selected from the group consisting of alkali metal nitrates and zinc nitrate, and during the metal coating process maintaining in said coating bath a $P_2O_5/NO_3$ ratio ranging from about 1:2.5 to about 1:1 by replenishing the coating bath depleted in the coating operations with a feed liquor comprising an aqueous solution of zinc phosphate, at least one nitrate selected from the group consisting of alkali metal nitrates and zinc nitrate, the $P_2O_5/NO_3$ ratio of the feed liquor being within a range from about 1:1 to about 1:0.5, and also adding sodium nitrite as oxidizing agent in an amount not more than about one tenth of the weight of $NO_3$ contained in the feed liquor.

### Spraying Apparatus

*U. S. Patent* 2,864,334. *Dec.* 16, 1958. *E. T. Stocker, assignor to Western Electric Co., Inc.*

An apparatus for successively spraying material on opposing surfaces of a spiral portion of an article.

### Spray Gun

*U. S. Patent* 2,864,649. *Dec.* 16, 1958. *J. R. Adams, assignor to Cline Electric Mfg. Co.*

A spray gun of the type described.

### Spray Guns for Spraying Two or More Materials

*U. S. Patent* 2,864,653. *Dec.* 16, 1958. *K. H. Liedberg and S. F. A. Peterson, assignors to Atlas Copco Aktiebolaget.*

A spray gun for simultaneous spraying of two materials such as paint or lacquer and a hardening agent for paint or lacquer.


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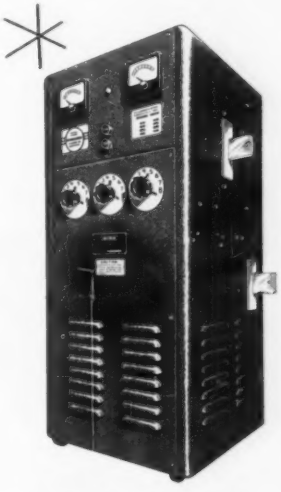

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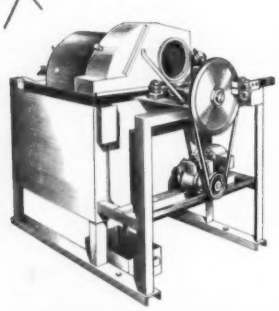

. . . UNICHROME PLATING BARRELS

### Vitreous Enameling

*U. S. Patent* 2,864,721. *Dec.* 16, 1958. *B. W. King and J. R. Schultz, Jr., assignors to The Fletcher Enamel Co.*

The process of producing a vitreous enameled metal body which comprises: mixing with clay and water unfritted enameling materials to form a slip, said enameling materials being capable of forming a glass within a temperature range of from 1200° F. to 1700° F., and said enameling materials being in such proportions as to yield, on calculated analyses, an enameling material consisting essentially of:

| | Weight percent |
|---|---|
| $Fe_3O_4$ | 1-15 |
| ZnO | 0-9 |
| $SiO_2$ | 30-45 |
| $B_2O_3$ | 17-28 |
| At least one material selected from the group consisting of $Na_2O$ and $K_2O$ | 11-22 |
| CaO | 3-8 |
| $Al_2O_3$ | 0-7 |

applying the resulting slip to a steel body to a dry weight of from 8 to 17 grams per square foot two sides, and firing within a temperature range of from 1200° F. to 1700° F.; applying a vitreous enamel cover coat and refiring.

### Corrosion Preventive

*U. S. Patent* 2,864,726. *Dec.* 16, 1958. *A. A. Manteuffel and G. R. Cook, assignors to The Pure Oil Co.*

The process for the formation of an adherent, corrosion-resistant coating on a ferrous metal surface which comprises contacting said ferrous metal with a substantially water-emulsion-free mineral oil composition consisting essentially of a mineral oil boiling in the lubricating oil boiling range, an emulsifier, a coupling agent in which water and mineral oil are mutually soluble and at least about 1%, by wt. of total composition, of total water but less than that amount which causes substantial phase separation and emulsification of said oil composition.

### Conversion Coating for Magnesium

*U. S. Patent* 2,864,730. *Dec.* 16, 1958. *D. H. Kinder and R. Stricklen, assignors to Allied Research Products, Inc.*

A composition for use in aqueous solution to impart a protective coating to magnesium and magnesium alloy articles consisting essentially of a hexavalent chromium compound selected from the group consisting of chromic acid and salts thereof in amount of about 14 to 37%, a nitrogen-containing compound selected from the group consisting of nitric acid and salts thereof in amount of about 32 to 70%, and a chloride compound selected from the group consisting of hydrochloric acid and salts thereof in amount of about 4 to 50%, the foregoing percent ranges being calculated on the basis of the total weight of active ions present in an aqueous solution containing said composition and having a pH of from about 0.0 to 2.0.

### Bright Gold

*U. S. Reissue Patent* 24,582. *Dec.* 23, 1958. *E. C. Rinker, assignor to Sel-Rex Corp.*

In the art of forming a layer in excess of .000005" thickness of bright gold containing about 0.1 to 2% of silver by electrolytic deposition, the method which consists in electrolyzing an electrolyte containing the following components in the following proportions dissolved in one liter of water:

| | Grams |
|---|---|
| Free potassium cyanide | 45 to 200 |
| Potassium gold cyanide | 6 to 48 |
| Potassium silver cyanide | 0.08 to 0.4 |

the proportion of potassium silver cyanide calculated as silver to potassium gold cyanide calculated as gold being between 0.1% to 2% by weight, and maintaining said bath at a temperature of between 45° F. and 80° F.

### Contact Wheel

*U. S. Patent* 2,865,144. *Dec.* 23, 1958. *W. K. Seward, assignor to The Carborundum Co.*

A contact wheel comprising a hub and a rim, said rim having a transversely serrated peripheral surface comprising a series of transverse lands and separating grooves disposed about the entire periphery of the wheel, said rim being composed of a non-abrasive rigid material with the grooves thereof substantially filled with a resilient solid material softer than the material of the lands, whereby the lands and filling form a substantially cylindrical surface.

### Degreaser

*U. S. Patent* 2,865,145. *Dec.* 23, 1958. *I. L. Lans, assignor to Metalwash Machinery Co.*

Apparatus including a tank, a carrier

basket, guide means for guiding the carrier basket along a straight vertical path of movement, means for causing vertical displacement of said carrier basket within said tank, and means for causing rotation of said carrier basket about its transverse axis simultaneous with said vertical displacement, while said carrier basket travels along a vertical guided path.

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## CONFERENCE IN RETROSPECT

(*Continued from page* 58)

interest which they aroused. Attendance at all sessions was remarkably high. Convention delegates were evidently quite prepared to risk mental indigestion. The likelihood of physical indigestion was also not entirely remote as delegates attempted the impossible by hurrying from one meeting to another on the occasions when simultaneous sessions were held. While the fact that sessions had to be duplicated is but another tribute to the efforts of the Education Committee, it must needs add to the frustration of the conscientious delegate who finds he must choose between two equally important sessions he would like to attend. There is no easy answer to this problem, which afflicts all Conventions. To omit the duplicate sessions would significantly reduce the number of papers and, anyway, all the papers will in the long run be published and available to every delegate, so that the course adopted was perhaps the lesser of the two evils.

### *The Exposition*

Apart from the Technical Program, the event which delegates found most valuable was the Industrial Finishing Exposition. Although this was staged at the Armory, about three-quarters of an hour's ride from the headquarters of the Convention, the excellent transport arrangements made it possible for delegates to visit the Exposition as frequently as they might desire. Overseas delegates in particular took full advantage of these facilities, which in fact placed before them a first-class cross section of metal finishing processes and products offered by American supply houses. Here again there was ample evidence of long and patient planning by the Industrial Finishing Exposition Committee under the Chairmanship of *Howard McAleer*. It was well arranged and made it possible for those who had come long distances to inspect the most up-to-date equipment offered by American manufacturers from many parts of the country, which would otherwise have required considerable travelling. Furthermore, it gave foreign delegates an opportunity to meet the technical salesmen of important companies within the precincts of a single building. It is to be hoped that the exhibitors found the effort in time and cost worthwhile but they can be assured that it at least enhanced their prestige and put them in good standing with overseas visitors.

Exhibits with historic interest particularly intrigued European and specially British visitors. The Adams papers and personalia shown on the stand of "Metal Finishing" Publication, for example, were the subject of considerable comment and appreciation. This raises the possibility of including such an Exhibit at succeeding International Conferences—and, indeed, to pursue the possibility further, whether such an Exposition should not be devoted, in part at least, to an exhibit emphasizing the advances that have occurred since the preceding Conference. An Exhibition, in effect illustrating advances during the last five years, should be both educational and instructive and act perhaps as an inspiration to further achievements.

### *General Impression*

As one of the delegates who had the opportunity of exchanging views with others who attended from overseas, I am sure that the concensus was that this was a highly successful conference well worth the time and effort required to attend it. Not only was the information to be gleaned from the technical papers valuable and the cross-section of subjects such that all interests must have been touched at some point, but it was specially successful socially. It was a happy Conference from the word "go" and much as the British delegates are accustomed to American standards of hospitality, there was general agreement that our friends had set a new high on this occasion in their determination to prove their regard for their friends overseas. I am sure I speak for all in our delegation when I say that we are truly grateful for this unique opportunity to have met, in technical discussions and social events, under such ideal conditions those who constitute our opposite numbers on the other side of the Atlantic.


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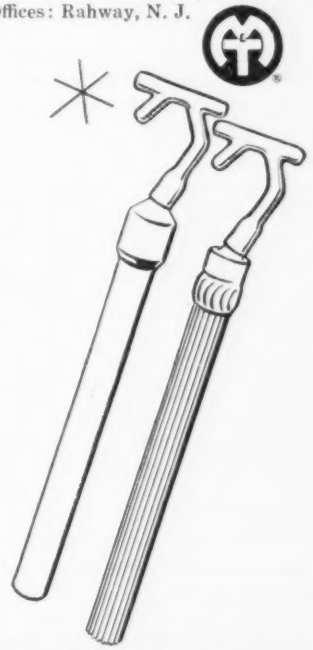

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# ABSTRACTS

### Thick Coatings of Bright Rhodium Plate

R. Levy: *Werkstoffe und Korrosion*, **9**, No. 11, 686-89.

In recent times, bright rhodium plating has found extensive use in electronics and electrotechniques, usually for coatings not more than 1 micron thick. Coatings whose thickness varied between 2 and 25 microns, were always mat.

For certain purposes it is desirable to obtain thick, bright rhodium coatings. The author investigated the effect of various additions to the plating bath. It was found that the addition of certain metal salts delays the disappearance of the brightness with increasing thickness of the plated coating, up to 2 microns, but the most outstanding brightening addition agents appear to be surface-reactive substances. A series of synthetic surface-reactive substances, anionic, cationic and non-ionic, was investigated. Some of these were found to give bright coatings with rhodium thickness which far exceeded 10 microns. The porosity of the coatings and its surface tension in addition were greatly reduced and, as a result, the corrosion resistance of the rhodium was clearly improved. The results obtained are not constant throughout, and the investigational work in this direction is being continued.

### Investigations of Lacquer Coatings on Aluminum

B. Mielnik and J. Lukasiewicz: *Prace Instytutu Lotnictwa* (Poland), No. 3, 28-41.

Various enamels and lacquers on drying oil and synthetic resin basis were investigated comparatively with regard to film hardening, elasticity at —50°C., impact resistance, and resistance to water and to hydrocarbons (petrol).

The investigations of the water resistance took the form of a long-term test. After air-drying for 48 hours and 2 weeks, the coatings were subjected to 3, 6, and 18 hours immersion in water. Aluminum and anodized aluminum sheets were used as the sub-surface. The test results are shown in tables and diagrams.

### Experience with Corrosion-Resistant Chromized Steel Bolts

E. Taubert: *Draht* (Germany), 505-507 (1958).

It has been found that by means of the diffusion of chromium into a steel specially alloyed for the chromizing process, a surface-protective zone similar to a stainless steel is formed which offers sufficient protection against any corrosive attack. This chromized zone has a thickness of about 0.1 to 0.12 mm.

Chromizing is conducted at a high temperature with halogen compounds of chromium. This zone has a gradual transition into the steel and the chromium is locked firmly into the iron lattice (alloyed), which gives complete assurance that no flaking of the chromized zone can result. This chrome-steel coating is elastic to some extent, so that it gives upon deformation without tearing or flaking. The corrosion protection is in no way reduced by mechanical effects as a result of impact or bending. The elasticity of the chrome-steel zone is shown very clearly with tensile tests which are terminated shortly before the rupture-loading point is reached. At the restriction of the test part no cracks or pores in the chromized coating can be observed.

Any seizure of the threads which can frequently happen as a result of cold-welding of two metals of the same composition, can be entirely avoided by a subsequent after-treatment. With a subsequent heat treatment of the chromized steel the strength of the chromized bolts can be improved. The chromium content in the surface zone of the steel also provides very good heat resistance. Examples from practice have shown that good results in service are obtained with these chromized bolts.

### Perspiration Problems in Metal Finishing Techniques

E. F. Goebel: *Feinwerktechnik*, **62**, No. 11, 391-394.

Perspiration consists of 98% water. The remainder is composed of about ¾ inorganic salts, mainly sodium chloride, and calcium, potassium, and magnesium phosphates with about ¼ organic compounds, such as urea, uric acid, liquid fatty acids, cholesterine, lactic acid, citric acid, etc. The sodium chloride content of perspiration is generally above 0.5%.

As the formation of hand perspiration cannot be controlled by anyone and, on the other hand, handling of finished or semi-finished work parts is always necessary, the depositing of the perspiration on the bright metal surfaces of such work parts must be avoided as far as possible. A simple means to ensure this is described as follows: A linen bag about the size of a pear and filled with Vienna chalk, hangs beside the workplace ready to be gripped. From time to time the inspector handling the parts grips the linen bag and in this way, continuously powders his hands with the Vienna chalk. The pleasant feel of dryness of the hand which is achieved in this way, as a consequence, insures that the worker is always wanting to grip the bag of his own volition.

### Electroplated Gold-Copper Alloys

F. Sauter: *Diss. Tech. Hochsch.* Stuttgart.

The object of this investigation was to study the possibilities of the deposition of electroplated gold-copper mixed crystals and consequently to obtain plated red gold deposits, resistant to discoloration. The solution contained 20 g/l. Cu as $K_2Cu(CN)_3$, to which gold was added as $KAu(CN)_2$ in amounts of up to 10 g/l. The solutions contained no free cyanide and were operated mostly at 60°C. with still electrolytes. The anodes were of stainless steel.

For the deposition of electroplated gold-copper mixed crystals it is necessary to equilibriate the separation potentials of the two metals with one another. This was achieved by loosening and breaking-down the complex $K_2Cu(CN)_3$ by which the deposition potential of the copper is moved to higher values.

By means of X-ray determination of the lattice constants of the electroplated gold-copper alloys, it was shown that the lowering of the pH value of the solution and additional solution of CuCN in the bath, loosens this complex to such an extent that the gold can absorb copper as a mixed crystal to an extent of up to 25% by weight.

The lowering of the pH value resulted from the addition of $NH_4H_2PO_4$. Up to a pH value of 6.6 no decomposition phenomena were observed.

With the addition of CuCN, apparently there occurs a disproportioning of the monovalent copper ions. This

can be suppressed by the addition of sodium sulfite, or the divalent copper ion complex formed can be fixed by the addition of potassium tartrate.

The gold-copper alloy deposits obtained were mostly bright and relatively brittle.

### Surface Treatments for Aluminum

H. Kohlhase: *Feingeraete Technik* (Berlin), **7,** No. 1, 38-41, 86-90, 371-75.

With the MBV process for the surface treatment of aluminum the protective coating obtained by chemical oxidation is effective against various corrosive attacks. The corrosion resistance is not as high as with anodizing but, in association with a lacquer film, apart from the improved adhesion, the corrosion-protective action is quite appreciable.

With this it can be of advantage to increase the normal treatment times, so that the coatings are correspondingly thicker and are more absorbent. The MBV process is applied to pure aluminum and to all the copper-free alloys. For the treatment of the copper-containing alloy types, small amounts of sodium silicate are added to the MBV bath (EW process). The EW coatings are smoother and denser and less suitable for the reception of lacquer coatings.

The aqueous MBV solution contains 5% sodium carbonate and 1.5% sodium chromate. The color of the coatings is between bright and dark-gray. On the other hand, aluminum-magnesium alloys, with increasing magnesium content give progressively brighter-appearing coatings with the same corrosion protective value. The previous normal addition of caustic soda for obtaining gray coatings is no longer customary as no real advantage is obtained. The thickness of the MBV coating averages 2 microns; it is, thus, considerably thicker than the natural aluminum oxide coating. The coating is firmly anchored to the metal but possesses poor abrasion resistance. Rapid destruction generally follows exposure to acids and alkalies.

Parts can often be processed without special pretreatment. Prior cleaning with organic solvents or special inorganic cleaners, however, is usual practice. Often, and particularly with cast alloys of the Al-Mg-Si type, a short treatment in an alkaline pickling bath is of advantage. The metal is then given an after-dip treatment in dilute nitric acid. Cast alloys treated in this manner also give uniform and spot-free oxide coatings. The bath is operated at 95° to 100°C. with a treatment time of 15 to 25 minutes. A thorough cold and hot rinsing is then given and the parts oven-dried at 100 to 150°C. Lacquer should be applied as quickly as possible. Small, heavy-metal parts assembled on the aluminum do not interfere with the coating formation.

### Corrosion Testing Procedures

W. Wiederholt: *Werkstoffe und Korrosion*, **9,** No. 3, 133-146.

Corrosion tests under natural service-life conditions very frequently require very long times, and the attack conditions are often subject to a natural changing cycle, difficult to ascertain, so that no real reproducible results are often attained. Accelerated laboratory corrosion tests are necessary so as to be able to characterize the behavior of parts in shorter times, under similar, reproducible test conditions. The test conditions in the laboratory, however, must conform to practical requirements if results which can be practically evaluated, are to be obtained.

In order to imitate climatic conditions in the laboratory, various corrosion test processes have been developed which are described in detail. In every case, it appears to be an advantage to render the corrosion resistance in terms not only on the basis of the behavior of a corrosion test procedure but to choose several corrosion test procedures with varying conditions and, from the aggregate results of this collective testing, to employ the material in practice with a consequent precise knowledge of its full possibilities and limitations.

### Bulk Anodizing of Aluminum and Aluminum Alloy Parts

M. Flusin: Paper read at the 6th International Congress of Engineering Fabrication, Paris.

Each part must be made the object of a separate connection and, treatment by means of a barrel or drum, immersed or semi-immersed, normally is not possible. If such a bulk treatment is attempted the parts in contact with the sides become covered with a thin coating of alumina at the first moments of the electrolysis. With the rotation of the barrel the contacts of the parts with the walls or between the parts is made with the interposition of a film of insulating oxide which stops further electrolysis. If, on the contrary, the drum remains stationary, the contact with the wall remains insured and the oxidation can continue normally. From this, the author developed the conception of basket anodizing of small parts in bulk.

Anodizing conditions are controlled according to the normal procedure and oxidation depends only on the handling of the parts. After numerous industrial tests, two types of anodizing baskets were developed, as a function of the shape and, particularly, of the average dimensions of the parts being treated. A truncated conical shaped basket was used for parts of small dimensions — smaller than about 10 mm. — and a cylindrical basket for parts of average dimensions — above about 10 mm. in size.

It is necessary, at all costs, to avoid heating of the electrolyte by the effect of the electrical resistance of the solution and the contact points between the workparts, together with the resistance of the anodized coating in the course of formation. The rise in temperature of the electrolyte in the basket should not exceed 23°C. when a sulfuric acid bath is used, otherwise a low-quality, powdery coating will be produced. With this electrolyte the more or less complete destruction of the anodized coating occurs above 26° to 28°C.

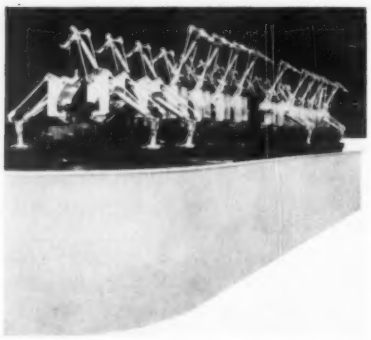
Industrial-scale tests served to develop the following simple and effective means to insure cooling of the electrolyte in the interior of the basket during anodizing. The cold electrolyte is introduced by means of a tube pierced with holes, fixed in the axis of the basket. The spacing of the holes in the tube decreases from top to bottom so as to distribute the solution feed uniformly along the length. The pressure of the electrolyte in the feed tube, it is found, should be between 100 and 150 g./cm.$^2$, representing a head of about 0.80 to 1 meter for a 20° Bé sulfuric acid bath. Compressed air is injected into the interior of the electrolyte feed tube under a pressure of 100-150 g./cm$^2$. The flow of compressed air gives an additional cooling effect. This compressed air method is not as effective as the cooled electrolyte feed, but is sufficient in numerous cases. The basket is displaced along the anode bar during the course of the anodizing. The operation is conducted gently at 5-10 minutes interval.

# Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES

### Small Versatile Conveyor

*Hanson-Van Winkle-Munning Co., Dept. MF, Church St., Matawan, N. J.*



The Fleximatic is designed for use by the plater who needs a compact and versatile machine. It is claimed that this small conveyor can do anything a full size conveyor can do, as it was specially designed to incorporate many exclusive optional features, among them the Dial-A-Cycle which allows the operator, by setting a dial, to pick which treatment tanks a given carrier will enter or by-pass.

Vertical oscillation is another optional extra. According to the company, maintenance-free operation is guaranteed by the simplicity of the system. Sixty inches of oscillation a minute is the standard setting. Other optional extras available are: Delayed set-down, Select-A-Cycle, By-Pass, Advanced Pickup and Bi-Polar Current.

The machine is a return type processing or electroplating conveyor. The gross load for one carrier is forty pounds, work and rack. The rack size is a maximum of 18″ in the direction of travel, 14″ thick, and 36″ long with a 9″ hook. The machine requires a head room of 9 ft. 3 inches and floor space (width) 102 inches wide with 30 inch tanks.

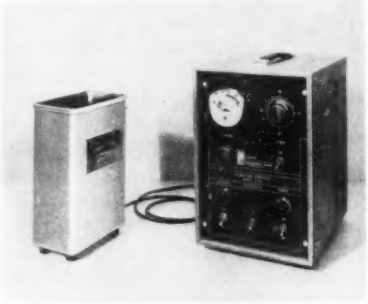
The length of the machine can vary to suit any particular application. The shipping dimensions of the machine are 8 feet 2½ inches high by 7 feet 6 inches wide. For short machines it is possible to ship the conveyor as one unit. Longer machines are sent in two separate sections which are bolted together in the field to make a complete unit. The minimum immersion time is six seconds.

The unit is shop assembled and completely tested and adjusted prior to shipment.

### Ultrasonic Cleaner

*National Ultrasonic Corp., Dept. MF, 111 Montgomery Ave., Irvington, N. J.*

A new unit for small part cleaning applications in which high energy density is required, Model 200 features a one-gallon heavy-gauge polished stainless steel tank with 43% of the bottom covered with driving elements, a more complete coverage than is found in



most ultrasonic cleaners. Actual radiating surface is 12 square inches.

The 115 volt A.C. single-phase 60-cycle generator, designed for continuous operation, delivers an average power output of 60 watts and produces peaks of 240 watts. Features include 0-60 minute timer, one tube oscillator, provision for remote control of equipment, front panel switching which permits a choice of either of two transducers and circuit breaker and 3-wire ground protection. Unit can be adjusted to available line voltage.

### Barrel Finishing Compound

*DuBois Co., Inc., Dept. MF, 1120 W. Front St., Cincinnati 3, O.*

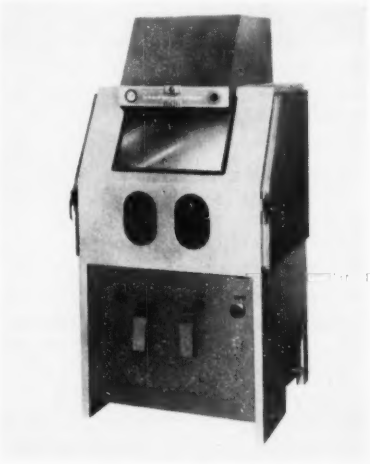
Burnishing and coloring metal by tumbling is improved considerably through Cycle, a new, free flowing, dustless product. The product is claimed to cut operating time over previously used methods. It does not tarnish brass or rust steel, and helps control hard water build-up, as it lubricates and conditions water during the deburring process. It also helps to remove oil and grease, light rust and oxide coating while it burnishes.

### Liquid Blasting

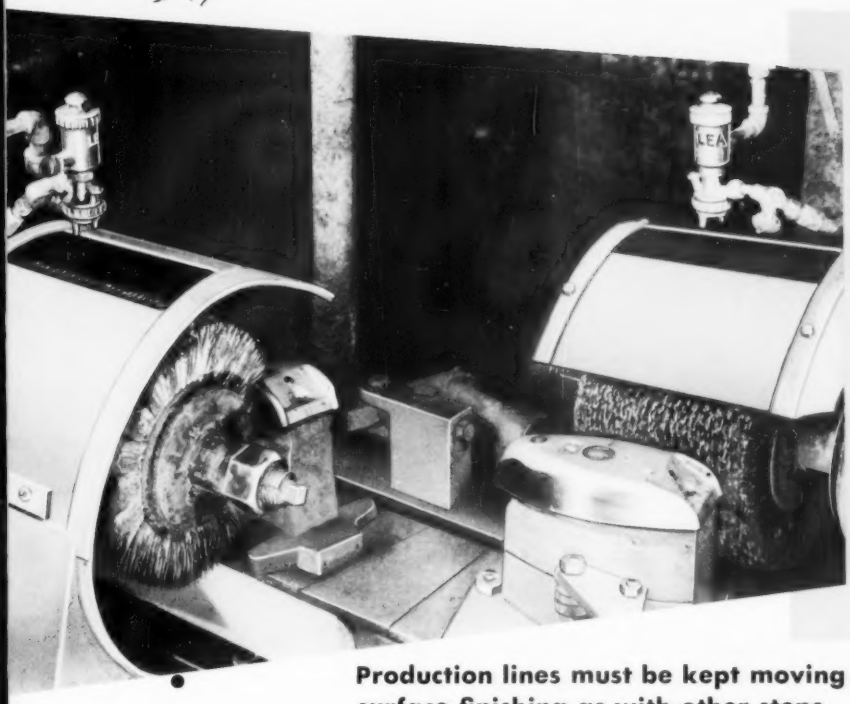
*Perfecto-Peen Div., Aero-Test Equip. Co., Dept. MF, P.O. Box 10627, Dallas 7, Texas.*

Model A-50, a standard machine for use in a new process of glass-jet peening uses specially-treated minute pure glass beads in a slurry solution for peening, cleaning and finishing surfaces. Masking is not required down to and including a 4mu rms finish. There is no imbedment or contamination or material surfaces. Further operations are eliminated. In addition, extremely delicate parts can be peened without altering critical b/p dimensions, hinged and feather burrs can be removed.

The machine is welded stainless steel, finished in two-tone gray. It is operated by a knee lever for manual freedom. A second knee lever washes a 17-in. x 24½-in. observation window. Holes in doors on each side of the



# LIQUABRADE



## SPRAY BUFFING at its AUTOMATIC BEST!

**Production lines must be kept moving... with surface finishing as with other steps.**

LEA LIQUABRADE, available in a wide range of abrasive grain types and sizes, is the ideal liquid abrasive composition for automatic buffing. Already widely used and growing in use. LIQUABRADE is enabling companies with big production schedules to keep the buffing line moving right along while producing the desired finish at exceptionally economical levels.

- ***Here are some of the high light economics:***
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- **production much faster, of course, than with bar applications.**
- **the finish is more uniform due to automatic, steady, uniform spray application and uniform cutting action.**
- **buffs last longer.**
- **all operations are automatic and continuous.**

In large measures these same advantages apply to hand-fed articles with a single wheel. One doesn't have to have production lines to derive values from Lea Liquabrade spray buffing operations.

We'll be glad to send you full details with detailed range of grit grades. Also suggest how you can set up your operations for spray buffing if you will give us the details of your present operation and a description of your product and the finish desired. Better yet, send samples.

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Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, Derbyshire, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.



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# LEA-RONAL

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...a simple production test will prove it. We're not often given to superlatives but this AURO GLO really is something! You should check its values for yourself. No elaborate preparations or change-over procedures are necessary to put AURO GLO into your plating setup so why not order a sufficient quantity to test and see if it doesn't bring to **your** production the following advantages:

- **bright deposits for all thicknesses of plate. Auro Glo deposits do not merely duplicate the brightness of the metal as do conventional bright cyanide golds but rather 'build' brightness.**
- **wide bright plating range (0-50ASF) permitting trouble-free rapid deposits.**
- **24 karat or alloy deposits.**
- **3 to 4 times greater hardness yet with far more ductility than deposits from conventional cyanide bright gold.**
- **heavy build up with electro-formed deposits that are mechanically workable.**
- **greater economy because through exceptional hardness and wear resistance, thinner deposits are permissible.**
- **dense, porosity-free deposits, passing all tests of major electronics parts manufacturing.**
- **no spotting out or bleeding out even at elevated temperatures or prolonged storage.**
- **exceptionally stable bath; simple to use.**
- **excellent solderability.**

For those interested in gold for decorative use, Auro Glo offers for the first time Hamilton Shades in a gold for heavy deposits.

As with all Lea-Ronal developments, Auro Glo has been production-tested for well over a year prior to this announcement. It is the superior gold plating formulation. If you electroplate gold, test the Auro Glo process.

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*Patented and Patents Pending

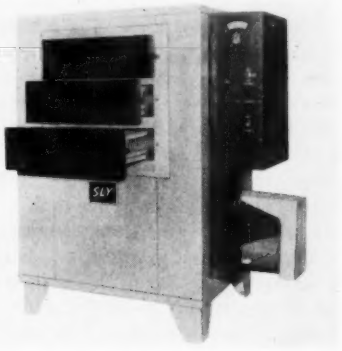
working chamber permit peening long or bulky pieces. The company can design special fixtures for semi-automatic production, can also either adapt the unit for automated set-ups or engineer custom models to suit any automation requirement.

All components are compactly installed in a cabinet fitted with standard plumbing and power connections. The machine has a sump containing the slurry solution of specially-treated glass beads, a feed system powered by an external air supply and a nozzle unit. No pump is required. A detachable drain tank on casters is located beneath the cabinet to collect overflow and to facilitate changes in glass bead sizes for different peening applications. Flushing time for bead change is 30 minutes maximum.

Machine dimensions are: 7-ft. 7-in. height x 3-ft. 6-in. width requiring about 40 sq. ft. of floor space with doors open. Shipping weight approximately 800 lbs. Operating requirements are: voltage 110-v 60-cycle a-c; air pressure 120 psi/50 cu. ft. minimum; water requirements are negligible.

### Cabinet Ovens

*W. W. Sly Mfg. Co., Dept. MF, Cleveland 1, Ohio.*




A new line of drawer-type cabinet ovens can be operated with gas or electricity. Heat ranges from 200° F. to 800° F.

Features of the ovens include extremely close temperature control, compact overall dimensions, rugged construction and low initial cost.

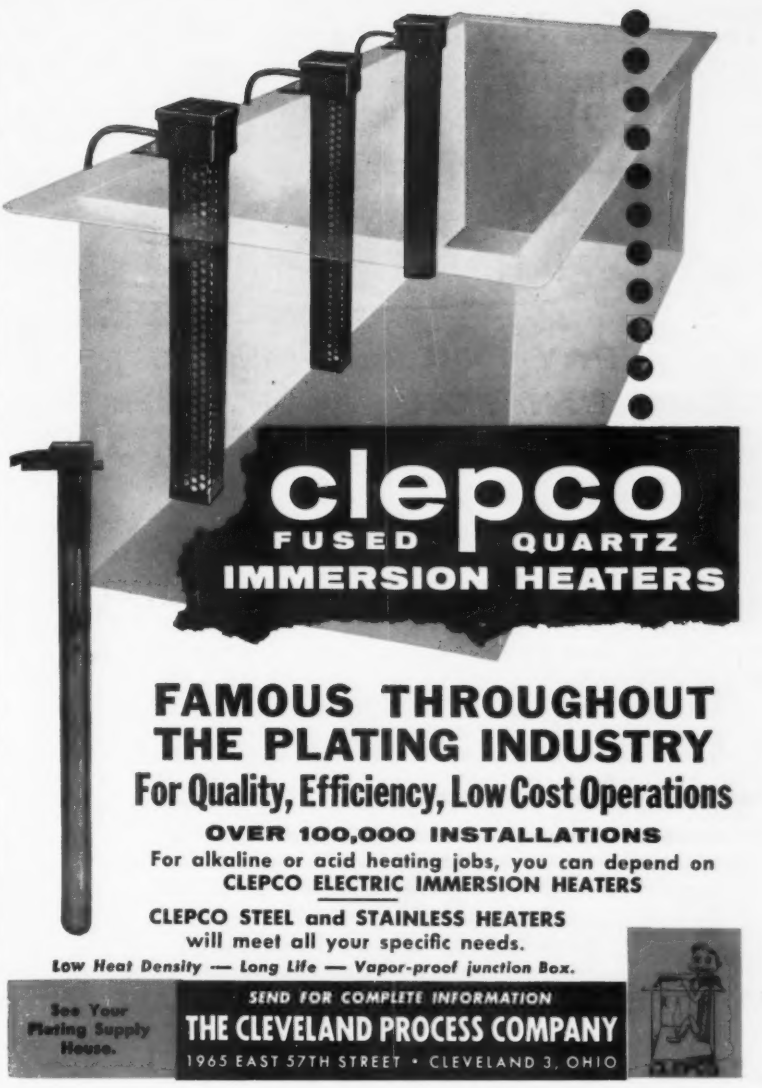
### Airless Spray System

*Spee-Flo Co., Dept. MF, 6614 Harrisburg Blvd., Houston 11, Tex.*

HydraAirless 20 is designed to serve a wide range of spray operations where the elimination of overspray is the primary object. Complete as illustrated, the unit makes it possible to spray in open areas without a spray booth. No atomizing air or heat is required and no elaborate precautions need be taken for health or safety. Overspray is virtually eliminated. Material savings average 40%, it is claimed.

A unique feature of the unit is the ease of conversion from standard unheated airless spraying to full temperature and viscosity control. This is accomplished by the quick attachment of the heater and exclusive recirculating assembly to the basic unit.

The new system is engineered for maximum efficiency, long service life and trouble-free operation. The double-action pump gives equal delivery on both up and down strokes. Super-wear-resistant working parts and tungsten carbide valve seats guarantee long service life. The air motor is fully divorced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from the pump allowing no paint material to reach the motor. This assures smooth, maintenance-free operation. All models are available in fixed or mobile units for 5 or 55 gallon requirements.

### Paint Resistance Tester

*Ransburg Electro-Coating Corp., Dept. MF, Indianapolis 23, Ind.*

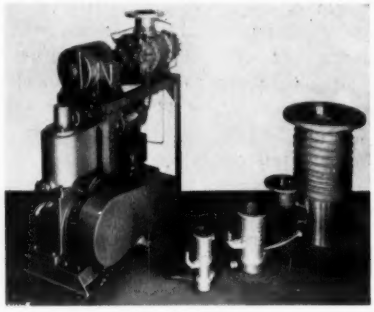
The new method amounts to measuring the paint's resistance to electric current flow, then adjusting it to the firm's established range by selection of proper solvents. Simplicity of this technique makes it of special importance to the paint user. It can be used in his paint mix room without the need of a trained laboratory technician.

The company is recommending the following resistance range for best performance of coating materials: 50,000-1,000,000 ohms for No. 2 Process automatic equipment; and 100,000-1,000,000 ohms for the No. 2 Process hand spray gun. These values are based upon the new test instrument—"Paint Resistance Tester" ($25.50). Available with the tester is a Triplett Model #630PL ohmmeter ($44.50).

### High Vacuum Pumps

*NRC Equip. Corp., Dept. MF, 160 Charlemont St., Newton 61, Mass.*

The H10SP oil diffusion pump has a rated pumping speed of 2600 liters per second, and an ultimate pumping pressure of $5 \times 10^{-7}$ mm Hg. The C-4-P unit is a short, low cost, purifying pump which will operate at the high end of the $10^{-6}$ mm Hg pressure range. The unit is 10¾ inches high, as compared with the 23-inch height measurement of the conventional 4-inch pump. Its capacity is 360 liters per second versus 270 liters per second of previous models, yet the cost of the unit is more than ⅓ lower.



The 300 cfm, 2-stage, mechanical booster pump is designed to provide very high pumping speed over a pressure range of from approximately 1 mm Hg to ½ micron. It best can be described, however, as an integrated 2-stage pumping system on a common base. The first stage, which consists of a Roots type blower, supercharges the second stage or forepump, which is a rotary gas ballast unit. The two pumps are connected in series and independently driven with induction motors. The use of the oil free, high-speed Roots blower is said to increase pumping capacity by more than a factor of 10 below a pressure of 1 mm Hg. Upon starting, the second stage pump does the pumping through the first stage pump until a pressure of 15 mm is reached. A pressure switch connected to the first stage pump inlet then starts this unit, and both pumps operate in series at all pressures below 15 mm Hg. Should the pressure at inlet rise above 15 mm Hg, the first stage automatically stops and the second stage resumes pumping until this pressure is again reached.

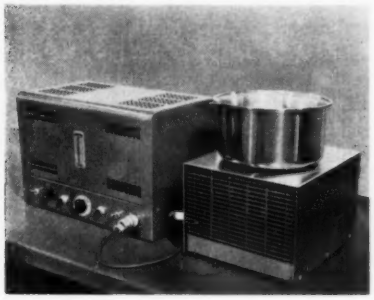
The standard electrical control con-

sists of a complete assembly in a NEMA 1 enclosure with a start-stop push button in the cover. Terminals are provided for connection to the supply and the pump motors, pressure switches and thermal switch. The standard control is for use with a 220 V or 440 V supply. If separate control components are desired, required starters and relays can be supplied for either 220 V or 440 V supply.

### Ultrasonic Cleaner Unit

*Blackstone Corp., Dept. MF, Jamestown, N. Y.*

The new Model GW-4A ultrasonic system is available with interchangeable lift-out tanks in either round or rectangular shapes. The most popular sizes are 7½" x 9¼" x 4" deep (1 gallon), 9⅝" x 11⅝" x 5" deep (2 gallon), 10" x 14" x 9½" deep (5



gallons), and 14" x 16" x 6½" deep (6 gallons).

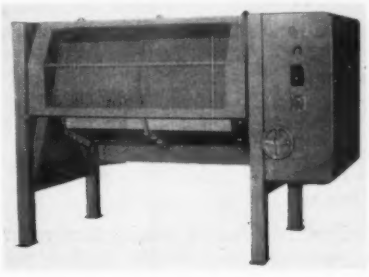
Uniform distribution of sound energy throughout all tanks is the outstanding characteristic of this equipment. It is made possible because of an exclusive patented air-cooled magnetostrictive type transducer, constructed from over 200 separate nickel elements directly attached to the cleaning tank. In continuous operation, low-boiling, low-flash or toxic solvents will not be overheated. The high thermal stability of the nickel elements makes it possible to use solvents at elevated temperatures up to 400° F. and the low operating frequency of 20 KC/sec provides superior cleaning action.

### Barrel Finisher

*Rampe Mfg. Co., Dept. MF, 14915 Woodworth Ave., Cleveland 10, Ohio.*

Suitable for large-scale production in parts finishing, grinding and deburring operations, the Model 30 precision barrel finisher features an exclusive patented "floating power" drive, which eliminates chain and sprocket mechanisms and permits simple, hand-wheel speed changing from 8 to 25 rpm. A built-in magnetic brake and protective safety guard in front of the barrel provide full control and safety.

Additional features of the Model 30 include: interchangeable barrels with a choice of one to three compartments, No-Seam orange vinyl plastic lining in



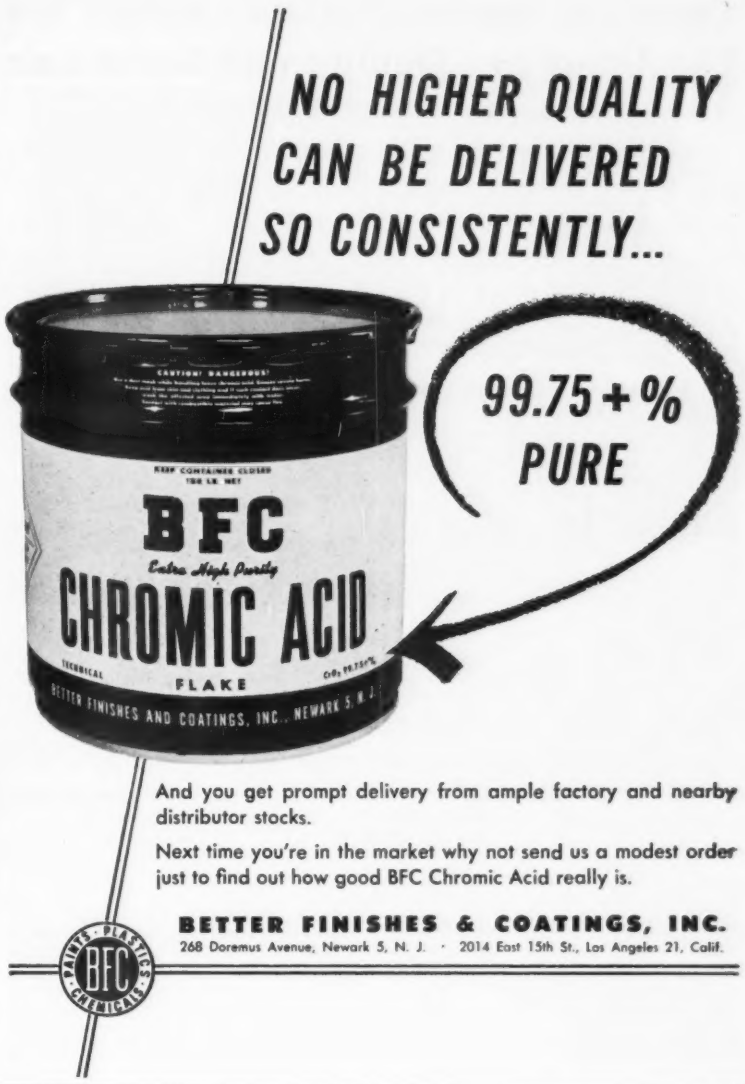
barrels, forward and reverse, jogging switches, and extra-rugged, heavy-duty welded steel construction.

Model 30 is available in two barrel sizes: 30 x 32 and 30 x 48. Interlock switch for safety gate, interval timer and other optional accessories can be furnished. The 30 x 48 measures 87" long x 67" wide x 59" high. The slightly smaller 30 x 32 weighs 2045 lbs. crated for shipment.

### Generator Brush

*Hanson-Van Winkle-Munning Co., Dept. MF, Church St., Matawan, N. J.*

A newly designed generator brush makes possible the use of the above manufacturer's Equaload brush feature by any generator user. Previously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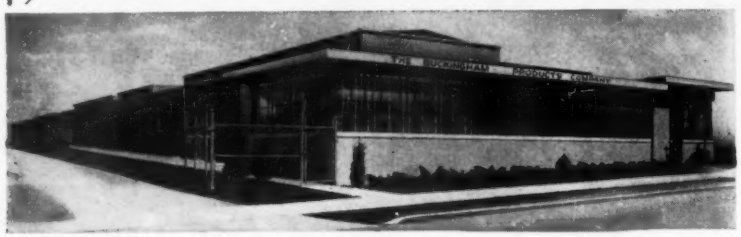

- Stainless Steel Composition
- White Finish
- Tripoli
- Chrome Coloring Composition
- Greaseless Composition
- Emery Cake
- Brass Coloring
- Emery Paste
- Burring Compound
- Grease Stick
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it was available only to platers using H-VW-M power generation equipment.

A new and simple means of insulating each individual brush from the brushholder has been devised, making for equal brush wear and no threading of the commutator. Now platers can up-grade their present generators by the simple installation of the newly designed brush.

### Hand Welder for Plastics

*Laramy Products Co., Dept. MF, Box 8, Hingham, Mass.*

The Kamlar high speed hand welder is claimed to weld uniformly at high speed, with consistently high strength. This lightweight, versatile tool is rugged. The alloy metal heating element and stainless steel barrel and tip practically eliminate breakage and corrosion, according to the manufacturer. It is also easy to assemble, operate and disassemble.

Additional features are an air-cooled handle, electrically insulated, for safe and comfortable prolonged operation; and a tacker tip for heat-sealing work together at intervals for temporary fastening.

### Spray Gun Conditioner

*Wisconsin Lab. Inc., Dept. MF, Dousman, Wis.*

Protexem Junior, a miniature vapor action conditioner which employs the

superior dissolving power of vapors, slips over the nozzle of the gun, making it unnecessary to dismantle the spray gun or to disconnect the material hose. A flexible diaphragm at the open end of this conditioner forms a tight seal around the nozzle of the gun.

It takes only two tablespoons full of vapor solvent to charge this small conditioner. Solvent evaporates within the conditioner and the vapors of the solvents soften the hardened paint and keep it in a dissolved condition. The gun is protected during brief interruptions, overnight or over the weekend. In fact, the vapor action will dissolve paint which has hardened on the nozzle of the gun so that the gun can be put into use without dismantling.

The vapor solvent used has a flash point of 70°F., moderate toxicity, moderate evaporation rate and high potency as a solvent. Because of the very small amount of solvent needed to produce the vapors, fire and health hazards have been all but eliminated.

### Water Displacing Liquid

*Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn.*

A new, improved formulation has been announced for Water Displacing Liquid No. 1, an organic solvent used for rapid shedding of water from metals. In the new, improved formulation the rate at which the displaced droplets of water settle to the bottom of the tank of displacing liquid has been greatly increased without sacrificing the very fast water shedding rate. This increases the product's ability to handle high volume production without the formation of a milky suspension of water droplets. Such water droplets in suspension usually cause staining of work being processed due to entrain-

ment of water on the work during removal from the liquid.

The product operates at room temperature and makes possible rapid drying of all parts without special equipment. It is particularly advantageous for drying of bulk work in baskets.

### Organic Finishes

*Maas & Waldstein Co., Inc., Dept. MF, McCarter Hwy, Newark, N. J.*

A new "Platelustre" finish is now available to simulate brass, gold, copper, bronze and other finishes over bright nickel plate, while providing a protective chemical coating. The finishes are applied by standard spray or dip processes.

### Strip for Anodized Aluminum

*Heatbath Corp., Dept. MF, Springfield 1, Mass.*

Two new dry powdered products known as Stripal #4 and #5 are now available for use in stripping anodized and oxide coatings from aluminum. #5 is an alkaline powder that can be used in a steel container at 2 lbs. per gallon without heat to give a rapid stripping of anodized or oxide coatings from aluminum. #4 is an acid powder used at 1 lb. per gallon at a temperature of 180°-190° F. for removing anodic coatings, leaving the aluminum bright and free from smut. Both products contain incorporated inhibitors for preventing attack on the underlying aluminum. These materials are excellent for use in stripping anodized coatings from racks and rejected parts.

### Vibratory Finisher

*B. W. Elliott Mfg. Co., Inc., Dept. MF, Binghamton, N. Y.*

Vibraslide 5 is a refinement of the company's #20 machine, introduced less than two years ago. The new model, with 5 cubic foot capacity and increased vibratory action, resulted from requests for a smaller vibratory unit.

The vibrators and vibrator motors on both models are identical, thus the same power is applied to ¼ the work load, and amplitude and vibratory movement are increased. The machines combine mechanical vibration with normal rotation, handling many parts that previously were not adaptable to barrel finishing, and making possible the finishing of inside diameters and recessed areas.

With the cylinder at rest, with only the vibrators in operation, the chip load speed is between 6 and 12 r.p.m. The machine operates at 3 h.p. The speed of the vibrator is 2,300 cycles per minute, and both ends of the barrel are synchronized with timing belts so that vibration is uniform throughout the media. The machine has all standard and J. I. C. controls. Overall dimensions are 67" by 42" by 50" high.

### Strippable Coating

*International Chem. Co., Inc., Dept. MF, 2628-48 N. Mascher St., Philadelphia 33, Pa.*

Thixstrip #1-A is a new aluminum-colored plastic peel-type coating that has been designed primarily as a protective paint-spray booth coating. It is also ideally suited as a general-purpose protective film for all metal parts during manufacture and storage.

The material produces an exceeding


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IF YOU PAINT OR STRIP PAINT

*if you clean anything...*

YOU CAN DEPEND ON THE

**BEST PRODUCTS AND THE BEST TECHNICAL SERVICE**

*from* DuBois Chemicals

LEADERS IN SPECIALIZED PROCESSING AND MAINTENANCE CLEANING COMPOUNDS FOR THE FINISHING FIELD

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SOLUTIONS

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ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:
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- Color constant
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We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating.
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Consultive Service
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"Where Glittering Elegance Reflects Lasting Quality."
100% PURE GOLD DKP SOLUTIONS
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LOngacre 4-1978-9

ly high-strength film that has excellent resistance to water, naphtha, oils, and most paint thinners. It is readily applied by brush, spray, or dip, and the resultant permanently flexible but dry film is easily removed from both plane and complex surfaces in a continuous film.

For a higher degree of light reflection, Thixstrip #1-W, very bright white, is recommended.

### Synthetic Pearl Pigment

*Mearl Corp., Dept. MF, 41 E. 42nd St., New York 17, N. Y.*

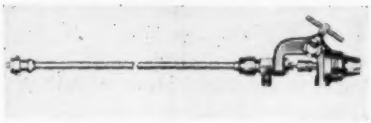
Nacromer Z is a new synthetic pearl pigment with greater brilliance than the best grades of natural pearl essence, it is claimed. In concentrated paste form, the pigment is available in formulations for use with nitrocellulose, ethylcellulose, vinyl lacquer, and most other coating vehicles. It may be applied by brush, spray, or dip.

In addition to simulating natural pearl effects, it is possible to obtain an almost unlimited range of lustrous effects by adding transparent pigments or dyes. Because it provides greater coverage, the new material may be used at proportions 30% less than usual for other pearl pigments, thus providing greater economy.

The pigment is available in two categories: "A" with a faintly yellow tone, and "B" with a faintly bluish tone. These color variations are not intense colors but are subtle shadings of the usual "silvery" pearlescent character. The exceptional brilliance emphasizes these color characteristics to an extent not perceived in pigments of lesser brilliance.

### Automatic Spray Gun

*Spraying Systems Co., Dept. MF, 3245 Randolph St., Bellwood, Ill.*



To bring the nozzle closer to the work, where space is too limited for mounting the complete nozzle assembly, a new AutoJet spray gun has extensions for hydraulic spray coating. A wide choice of interchangeable orifice tips permits selection of desired capacities and spray patterns. Extensions are supplied standard in 8", 18" and 24" lengths and special lengths are available as specified. The valve stem extends through the extension and the valve seat is positioned immediately behind the orifice tip to drip-free, instantaneous shut-off. Liquids are sprayed by hydraulic pressure at recommended pressures up to 125 psi. The shut-off valve mechanism is air operated at 70 to 100 lbs. pressure and provides automatic on-and-off spray nozzle operation at any required cycling frequency. The unit is designed so that liquids do not come in contact with the air operated control valve assembly, to assure trouble free operation and continued top efficiency performance. Extension, valve seat assembly and tip are easily cleaned by flushing with solvents. ½" diameter hole and locking screw in the body permits easy mounting and correct positioning of unit.

### Zinc-Rich Coating

*Carboline Co., Dept. MF, 32 Hanley Industrial Court, St. Louis 17, Mo.*

A new, all-inorganic zinc coating, called Carbo Zinc #11, is designed to provide a high degree of galvanic protection and to eliminate sub-film rusting in salt water, fresh water and solvent environment. It is effective at temperatures of minus 80° F. to plus 750° F., and can be used as a single coat protection or as a prime coat for other organic and inorganic topcoats.

Although applied by brush, spray or

roller, the coating is very similar to hot dipped galvanizing and has many of the same properties. It has the advantages of greater simplicity of use, economy and in the field application.

This coating provides a conductive zinc film. The reactive metal slowly goes into solution as needed when immersed to give direct galvanic protection to steel surfaces. Should coated steel become damaged, the unprotected steel will not rust.

One of the outstanding features of this new coating is its rapid drying time. Becoming water insoluble after 20 minutes, rain, condensation, spray or rising tide will not damage or dissolve the coating or adversely affect its performance. Painting can be done in 90-100% relative humidities.

### Rinse Aid

*Hanson-Van Winkle-Munning Co., Dept. MF, Church St., Matawan, N. J.*

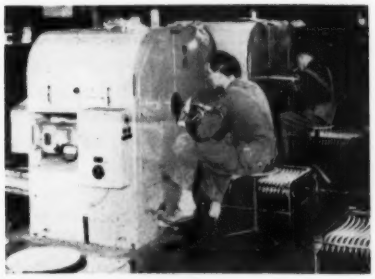
Drainage of plated parts is promoted and the number of plating rejects cut down by Rinsoff, a new rinse aid addition agent. Small concentrations added to the hot water rinse will reduce surface tension. Water rinses off faster and water stains are reduced to a minimum.

The product is a balanced combination of organic active agents and solvents. Only two fluid ounces are required per 100 gallons of hot rinse water under normal operation conditions. Additions of up to eight ounces per 100 gallons of water are recommended if water is uncommonly hard or dirty.

### Belt Grinding Machine

*Greif-Kerk G.m.b.H., (21b) Hagen-Haspe/Westf., Germany.*

The universal cylindrical grinding machine for straight, bent, round or oval shaped pieces, such as bicycle handlebars, is claimed to permit up to 75% savings in grinding material, with no brushing and composition required. A part can be ground and polished in about one minute to a finish suitable for immediate electroplating.



During the finishing operation the machine is entirely closed. Abrasive dust can be removed by suction, thus ensuring the advantage of a completely dust-free and accident-free operation.

### Barrel Finishing Compound

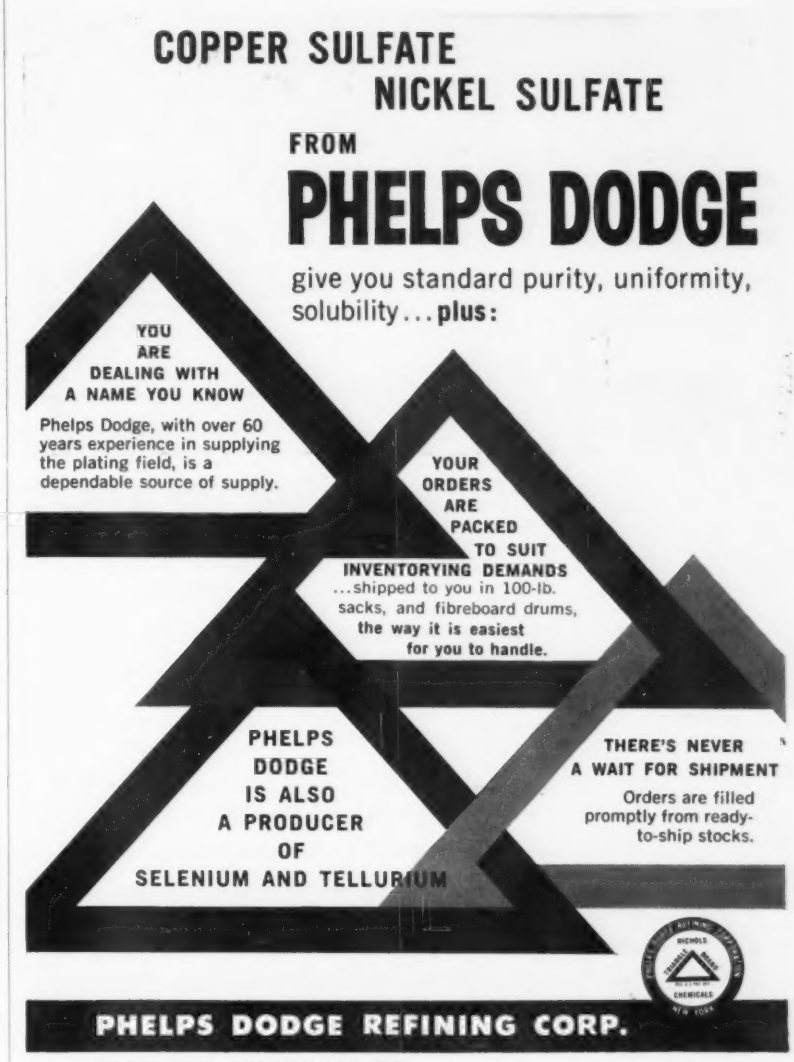
*Esbec Barrel Fin. Corp., Dept. MF, P.O. Box 929, Stamford, Conn.*

A new, dual purpose abrasive compound, No. 630, combines extra fast cutting action with fine surface refinement and cleanliness of surface on most metals, including steel, stainless steel, copper, brass, aluminum. During the first two to five hours, depending upon such elements as mass height, speed, etc., it cuts extremely fast and thereby greatly shortens cutting cycles. At the end of this cutting action, the abrasives break down and become polishing agents which produce extremely smooth surface finish on almost any type of metal. When completely broken down, it is in such finely pulverized state that it can be rinsed easily from the load.

### PVC Relief and Back Pressure Valves

*Milton Roy Co., Dept. MF, 1300 E. Mermaid Lane, Philadelphia 18, Pa.*

Newly-developed polyvinyl chloride (PVC) relief and back pressure valves protect positive displacement pumps metering such process liquids as dilute sulfuric acid, hydrofluosilicic acid, and hypochlorite solutions from excess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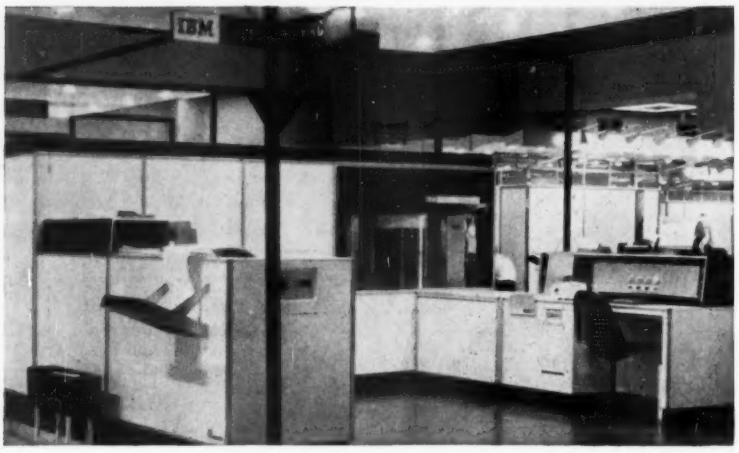


**ARMORHIDE® coating on IBM 305 RAMAC**

**New metal coating looks like leather and is ten times more abrasive resistant.**

Basically a textured plastic finish applied to metal and resembling leather, Armorhide is characterized by very high abrasion and chemical resistance. Similar to laminated Vinylite, Armorhide does not require expensive solvents and is sprayed on metal at a minimum of 60% solids at the gun.

Thus Armorhide is a new and entirely different kind of finish with physical and chemical properties unlike any other finish.

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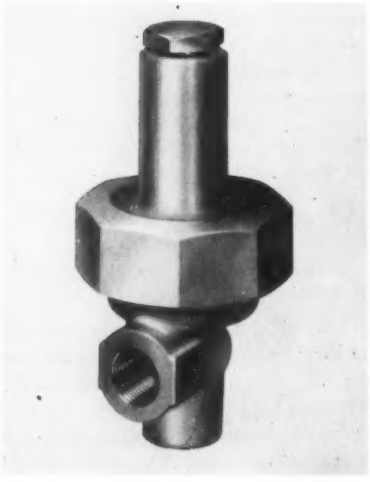
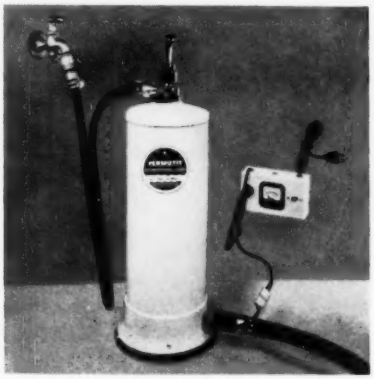


pressures. Both valves have Kel F or Teflon diaphragms protecting the upper internal parts from contact with corrosive liquids. The lower valve body (and the ball guide in the relief valve), which are in contact with the process liquid, are constructed of PVC. Alloy seats and ball valves are available in 316 stainless steel, Milroy stainless steel, and Hastelloy C. Manufactured in ¼" and ½" sizes, the relief valve can withstand pressures to 400 pounds per square inch at 68°F. and to 200 p.s.i. at 140°F. The back pressure valve is manufactured in the same sizes and can withstand pressures to 200 p.s.i. at 140° F.

The special design of the relief valve ensures tight shutoff below set pressure, a feature which is particularly important in controlled volume chemical metering. The back pressure valve maintains a head on the controlled volume pump discharge above suction pressure so that a liquid can be metered into a low pressure system. There are no servicing problems, since all internal parts can be cleaned or replaced without removing a valve from the line.

### Water Demineralizer

*Permutit Div., Pfaudler Permutit Inc., Dept. MF, 50 W. 44th St., New York 36, N. Y.*



Designed particularly for laboratory use, the MBD-6A Mixed-bed demineralizer connects directly to the water supply tap and, according to the manufacturer, will deliver water of measured low conduction at full line pressure.

Rugged 6" diameter metal tank holds a mixture of Q cation exchange resin and S anion exchanger in a container that may be removed and discarded or regenerated for reuse when exhausted. Capacity is approximately 1500 grains total solids, as $CaCO_3$. Low cost refill containers are available separately.

The demineralizer comes complete with a conductivity meter, conductivity cells and all necessary faucet and hose connections.

### Vibratory Finisher

*Lord Chem. Co., Dept. MF, 2068 S. Queen St., York, Pa.*

Model 1930E, a 15-hp Lorco Vibrator for precision finishing, operates from 10 to 100 times faster than tumbling barrels of comparable capacity, it is claimed. Media, compound and water are required as with conventional tumbling if a wet process is used. The load of parts and media rotates as a mass, and an additional scrubbing action between the load constituents

is induced through the controlled vibration. Both the amplitude and the frequency of vibration can be controlled, allowing the unit to do everything from coarse work, requiring severe cut-down, to the most delicate precision jobs. Interior finishes and finishes in shielded areas can be obtained.

The rubber-lined bowl is mounted on coil and leaf springs. Bowl is vibrated by an eccentric shaft. Drive speed is continuously variable over a range of from 0 to 2,100 rpm. Forward and reverse speeds and bowl tilt are controlled from a central control panel. A hydraulic cylinder tilts the bowl smoothly and efficiently. A bottom drain, as well as a rinse cover, allows parts and media to be rinsed and compounds changed without removal of load.

An easily adjusted mechanism compensates for weight variations from extremely light to very heavy loads. Proper lubrication is assured by an automatically operated pneumatic oil-mist system. Electrical controls prevent operation without adequate lubrication. Other controls prevent the drive motor from reversing before the bowl has come to a complete stop. The eccentric shaft is enclosed by a sturdy safety guard.

The machine is 88" long, 42" wide and 48" high. Bowl (unlined) has a volume of 6.92 cu. ft. Either a constant or a variable speed motor may be supplied; the latter has a frequency range of 0-2,100 rpm, forward and reverse. Motor specifications are: 15 hp, 1,750 rpm, 3 phase, 60 cycle, 208-220/440 volts.

### Electroless Gold Process

*Ever Lube Corp. of America, Dept. MF, 6940 Farmdale Ave., N. Hollywood, Cal.*

A new gold chemical deposit process permits deposit of gold evenly on all surfaces. While standard immersion process for gold plating have been limited to a few molecules thickness, the new gold achieves build-up thickness as desired by the engineer.

The process requires no electrical current, nor is it an ion exchange reaction; therefore, it gives the customer the advantages of even build-up on the most complex parts to thicknesses previously possible only by electroplating.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**ABBEY-Matic**

**for the Western Electric Company, leading manufacturer of electrical and electronic communications equipment.**

Only ABBEY-Matic's (patented) exclusive operating principles have the essentials required for this plant's exacting program of metal parts finishing.

**Total Automation** — ABBEY-Matic movements and timing are 100% automated for highest plating productivity-per-manhour potentials of any system.

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**Multi-Cycle Selection** — ABBEY-Matic Key-Card Dispatch pilots carriers unerringly throughout cycles. 100% electro-mechanically fail-safe. No "dialing" mistakes.

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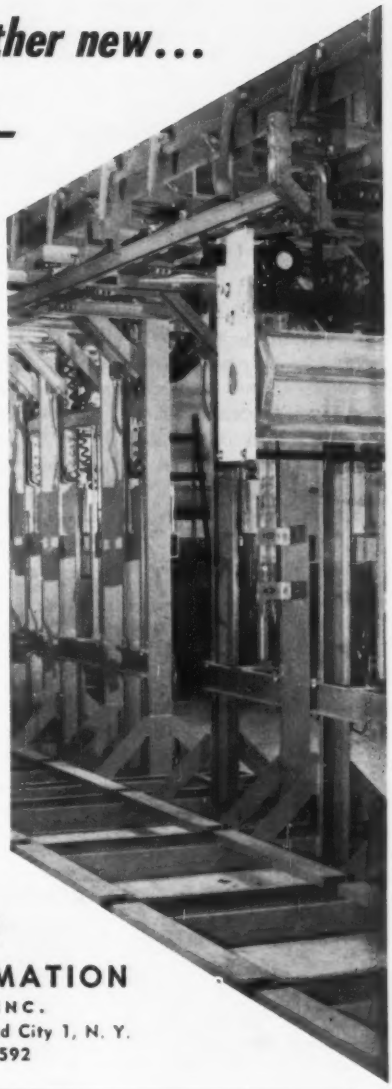


## Manufacturers' Literature

### Pickle for Copper and Silver

*MacDermid Inc., Dept. MF, Waterbury, Conn.*

Metex L-5, an acid base liquid for removing oxide and tarnish from copper, copper alloys and silver is fully described in Technical Data Sheet No. 77, a two-page usage and instruction sheet.

### Hand Welder for Plastics

*Laramy Products Co., Dept. MF, Box 8, Hingham, Mass.*

A four page, illustrated brochure gives details and advantages of the Kamlar hand welder and tacker for thermoplastics.

### Nickel Anodes and Salts

*The McGean Chemical Co., Dept. MF, Cleveland 15, O.*

The above firm has available a four

page booklet on its anodes and chemicals for nickel plating, with details on its Besplate, Rocarb, and rolled depolarized 99% plus anodes.

### Rhodium Plating

*Sel-Rex Corp., Dept. MF, Nutley, N. J.*

The 20-page, fully illustrated booklet "Rhodium Electroplating Processes," of which 10,000 copies were distributed on request in less than a year, has been revised and reprinted. The booklet tells when, where and how to use rhodium electroplate to improve product performance and reliability in electrical, electronic and other industrial applications. A wide range of rhodium's decorative applications are also discussed and evaluated.

Essentially a technical exposition of rhodium's unique metallurgical properties, the copyrighted booklet features graphs and charts showing rates of deposition under various operating conditions. Some of the detailed information contained includes: bath preparation and control of several different rhodium plating formulations; determination of rhodium in plating solutions; equipment required; current densities recommended and general operating instructions. The revised edition also includes a special "calculator" chart which permits quick, easy computation of rhodium electroplating costs.

### Zinc-Rich Protective Coating

*American Solder & Flux Co., Dept. MF, 19th & Willard Sts., Philadelphia 40, Pa.*

Drygalv, a zinc-rich liquid applied by brush or spray, is described and illustrated in an attractive 2-color bulletin, just released.

### Colored Conversion Films

*Conversion Chem. Corp., Dept. MF, Rockville, Conn.*

A new fact sheet on the Kenvert-O-Color process offers comprehensive information for application to various metals. It also suggests the use of dyes in combination with the appropriate chromate film to obtain the desired qualities of wet strength hardness, economy, ease of application, uniform finish with no bruising or marking.

### Booster Vacuum Pumps

*Vacuum Equip. Div., F. J. Stokes Corp., Dept. MF, 5500 Tabor Road, Philadelphia 20, Pa.*

A complete line of mechanical booster vacuum pumps is described in a new four-page folder, Bulletin 515, just published. Performance curves and complete specifications are given, as well as a description of the outstanding design features.

### Heat Exchanger

*The Carbone Corp., Dept. MF, Boonton, N. J.*

Bulletin PB-103 illustrates and describes Polybloc graphite heat exchangers. The four page booklet gives information on how they are made, how they operate, and lists their advantages.

### Electric Heaters

*Edwin L. Wiegand Co., Dept. MF, 7500 Thomas Blvd., Pittsburgh 8, Penna.*

New 64-page Catalog 60 illustrates the complete line of Chromalox electric process heaters and describes their many uses. Also included are a com-

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defies chemical attack, heat
Sethco
all plastic
High Temp. Epoxy
Sump Filter Pump
with detachable
FILTER CHAMBER
Model UAL-20 200-300 Gals./Hr.
other models from 50-1200 Gals./Hr.
Compact, takes little space in tank.
Get flexible filtration and agitation by: (1) Rotating your sump pump while having a filter chamber of the correct size attached to each plating tank. (2) Rotating your filter chamber using an individual sump pump in each tank. (3) Using one sump filter pump for ALL your tanks. (4) Using a separate sump filter pump for each tank where continuous filtration is necessary.
Self priming pump
½ Hp Motor
Epoxy body, assembly, impeller
Full view Lucite filter chamber
Adjustable sump pump and filter chamber assemblies supported from tank flange.
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MANUFACTURING CORP.
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2286 Babylon Tpke., Merrick, L. I., N. Y.

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SISAL BUFFS
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Call for Zippo Sisal Buffs when you have need for a fast cutting, heavy duty wheel to remove surface imperfections from ferrous metals. You will find they serve excellently to blend and smooth stretcher strains, orange peel, light die marks and polishing wheel grit lines. And—at the same time leave a bright surface finish.
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DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

prehensive application section and a technical section to aid in accurate calculation of heating requirements. Each product is illustrated and described with lists of types, sizes and ratings.

### Ultrasonics

*Acoustica Associates, Inc., Dept. MF, 26 Windsor Ave., Mineola, N. Y.*

*Ultrasonics* is a new quarterly illustrated review of ultrasonic progress. The first issue includes several feature articles describing ultrasonic cleaning applications in industry and informs how to get the most from this fast-growing industrial processing technique.

### Testing Services

*The Frank L. Crobaugh Co., Dept. MF, 3800 Perkins Ave., Cleveland 14, O.*

A new brochure detailing their complete testing facilities has just been announced by the above testing laboratory. Pictured and listed is modern equipment for organic and inorganic chemical analysis; metallurgical physical testing: metallography; spectrographic analysis; corrosion testing; radiography inspection of castings and weldments.

### Graphite Heat Exchangers

*Falls Industries, Inc., Dept. MF, Aurora Road, Solon, Ohio.*

This bulletin uses photographs, drawings, and capacities chart to describe the Impervite Modular Exchanger System for heating or cooling corrosive solutions.

### Paint Finishing

*J. O. Ross Engineering Div., Midland-Ross Corp., Dept. MF, 730 Third Ave., New York 17, N. Y.*

A 24-page reprint of six articles on factors to consider when planning a paint finishing system covers conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment, several oven arrangements, four methods of paint application, air make-up units, paint mixing equipment, stripping tanks, and control panels. Two line drawings illustrate a typical layout and give details of five stages of metal cleaning and preparation.

### Metal Strippers

*MacDermid Inc., Dept. MF, Waterbury, Conn.*

Metex DB and XB acid electrolytic strips for chromium, nickel, copper or bronze plate from zinc base diecastings, brass and aluminum are described in a 3-page Technical Data Sheet No. 20.

### Paint Strippers

*L. R. Kerns Co., Dept. MF, 2659 E. 95th, Chicago, Ill.*

Included in this 5-page comprehensive report is a very useful chart for correct stripper selection. The paper gives a description of the general types of paint strippers, recommendations for their use, and case history information from the appliance and metal products industry.

### Aerosols

*Industrial Supply Div., Sprayon Products, Inc., Dept. MF, 2075 E. 65th St., Cleveland 3, Ohio.*

An eight page illustrated catalog has been issued featuring the above firm's complete line of push-button products


for the "Solution to your Plating Problems" .... come to JELCO

BRASS ADDITIVE ... can be used in standard & high speed formulations — still & barrel plating

One of America's leading manufacturers
- BRASS Additive
- COP-BRITE
- BARREL COPPER Brightener
- BARREL NICKEL Brightener

- Increases efficiency and throwing power
- Produces brighter and faster plating
- Allows use of higher current density
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- Eliminates cyanide and ammonia fumes

A Proven Process!

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BOOSTS PRODUCTION
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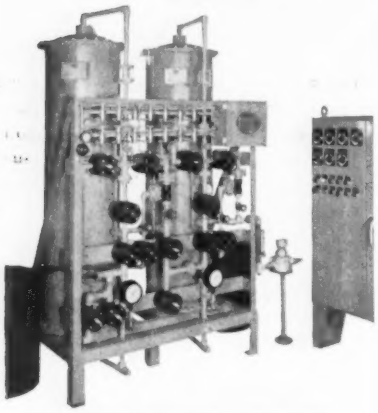

**COMPLETE AUTOMATIC DE-IONIZER**

Here is a complete, loaded, fully-instrumented, *automatic* ionXchange unit in a neat, compact, and *ready-to-operate* "package." It is equipped with our own Illco/Matic, all-plastic, air-actuated valves, which have been specially developed for ionXchange service. The Control Panel, also our own design and manufacture, provides all necessary quick-adjustment features, and requires only electrical hook-up to the terminal box on the frame. The only other connections required are to plant service.

**FULLY ASSEMBLED AND READY TO INSTALL**

All structural assembly of elements, all piping, all wiring, and all installation of air lines is done in our factory by men of long experience. Then the unit is tested for proper operation of all circuits, loaded with the proper supporting beds and resins, painted, bolted to a skid, and crated for delivery to the exact spot it will be used. *This is the quickest, easiest, and surest way for you to get a reliable, ready-to-go ionXchanger* — arranged and instrumented to suit your special needs, whatever they are.

*Write for Particulars*

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ILLINOIS WATER TREATMENT CO.
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Rockford, Ill.

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

for maintenance and production. These self-spraying products are used for color code enamels and marking paints, standard equipment finishes, special lubricants, protective coatings and degreasers.

### Water Treating Equipment

*Elgin Softener Corp. Dept. MF, 136 No. Grove Ave., Elgin, Ill.*

The newest in manual and automatic zeolite water softeners, demineralizers and deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators and degasitors are described in 24-page Booklet 615. Also covered are spray and tray type deaerating heaters and water treating chemicals for every need.

### Strippable Coatings

*Spraylat Corp., Dept. MF, One Park Ave., New York 16, N. Y.*

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## BUSINESS ITEMS

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Arthur R. McNeil

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*John K. Lilley*, 46, of Spring Lake, Mich., recently joined the sales-engineering staff of the *Rinshed-Mason Co.*, Detroit manufacturer of automotive

IF IT'S COLOR YOU WANT

use Luster-on® Chromates on Zinc

**Now . . . at a low, low cost . . .** you can get brilliantly bright and sparkling colors from an improved Luster-On Chromate dip process for your zinc-plated small parts.

**And . . . even more important . . .** these are not just dull identification colors. They are glamorous and sales-building golds, yellows, blues, reds, greens, violets, brass and copper hues.

*Write today for the full story on revolutionary LUSTER-ON COLOR. Sample gladly processed free.*

Use STRIPODE
the proved addition agent

- to strip nickel plate faster.
- to protect the base metal from pitting, roughening and etching.
- to save on use of acid.
- to eliminate need of sand blasting or heavy buffing.

*Order a trial gallon*

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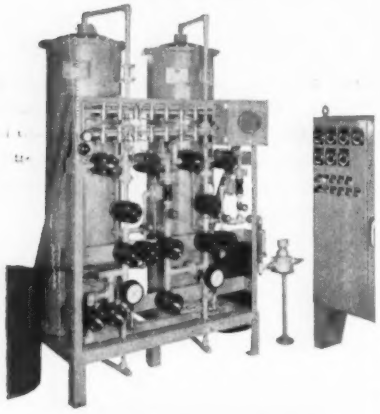
West-Coast: Crown Chem. & Engr., Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd., Montreal

**SET IT DOWN!**
**HOOK IT UP!**

ILLCO-WAY
ionXchange
EQUIPMENT



**COMPLETE AUTOMATIC DE-IONIZER**

Here is a complete, loaded, fully-instrumented, *automatic* ionXchange unit in a neat, compact, and *ready-to-operate* "package." It is equipped with our own Illco/Matic, all-plastic, air-actuated valves, which have been specially developed for ionXchange service. The Control Panel, also our own design and manufacture, provides all necessary quick-adjustment features, and requires only electrical hook-up to the terminal box on the frame. The only other connections required are to plant service.

**FULLY ASSEMBLED AND READY TO INSTALL**

All structural assembly of elements, all piping, all wiring, and all installation of air lines is done in our factory by men of long experience. Then the unit is tested for proper operation of all circuits, loaded with the proper supporting beds and resins, painted, bolted to a skid, and crated for delivery to the exact spot it will be used. *This is the quickest, easiest, and surest way for you to get a reliable, ready-to-go ionXchanger* — arranged and instrumented to suit your special needs, whatever they are.

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Rockford, Ill.

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CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

for maintenance and production. These self-spraying products are used for color code enamels and marking paints, standard equipment finishes, special lubricants, protective coatings and degreasers.

### Water Treating Equipment

*Elgin Softener Corp. Dept. MF, 136 No. Grove Ave., Elgin, Ill.*

The newest in manual and automatic zeolite water softeners, demineralizers and deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators and degasitors are described in 24-page Booklet 615. Also covered are spray and tray type deaerating heaters and water treating chemicals for every need.

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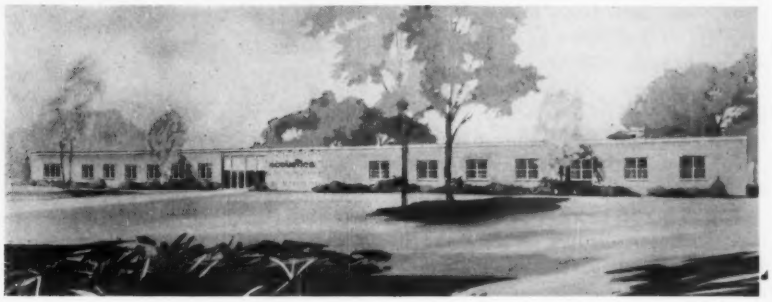

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IF IT'S COLOR YOU WANT

use Luster-on® Chromates on Zinc

**Now . . . at a low, low cost . . .** you can get brilliantly bright and sparkling colors from an improved Luster-On Chromate dip process for your zinc-plated small parts.

**And . . . even more important . . .** these are not just dull identification colors. They are glamorous and sales-building golds, yellows, blues, reds, greens, violets, brass and copper hues.

*Write today for the full story on revolutionary LUSTER-ON COLOR. Sample gladly processed free.*

Use STRIPODE
the proved addition agent

- to strip nickel plate faster.
- to protect the base metal from pitting, roughening and etching.
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- to eliminate need of sand blasting or heavy buffing.

*Order a trial gallon*

The Chemical Corporation
58 Waltham Ave. • Springfield 9, Mass.
West Coast: Crown Chem. & Engr., Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd., Montreal

John K. Lilley

and industrial finishes and chemical coatings.

He has been assigned to the company's western Michigan sales territory.

### Blakeslee Appoints New St. Louis Representative

The appointment of *R. B. Thompson* as sales engineer serving the St. Louis area has been announced by *G. S. Blakeslee & Co.*, Chicago.

Thompson, who has been with the company for over 10 years, has wide experience in all types of industrial metal cleaning. His headquarters will be at 1460 N. First St., St. Louis.

### New Editor for Industrial Wastes

*Dr. C. Fred Gurnham* has accepted the position of editor of *Industrial Wastes*, replacing *Prof. Don E. Bloodgood*, who has been forced by the pressure of his duties at Purdue University to relinquish the post.

Dr. Gurnham, professor and head of the Department of Chemical Engineering at Michigan State University, received his B. S. degree in chemical engineering from Yale University in 1932 and the M. Ch. E. and D. Eng. Sc. (Chem. Eng.) degrees at New York University in 1940 and 1942 respectively. Before coming to Michigan State, he was head of the Department of Chemical Engineering at Tufts University, 1949-52, and assistant professor of chemical engineering at Pratt Institute, 1938-41. He has spent 15 years as a chemical engineer in industry.

Dr. Gurnham is the author of a book, "Principles of Industrial Wastes Treatment" and has written numerous articles for professional journals on industrial waste disposal and other aspects of chemical engineering in industry. He is a consultant to the U. S. Public Health Service on relations with industry and in 1956 served as chairman of the National Technical Task Committee on Industrial Wastes. Dr. Gurnham is also Industrial Wastes Consultant to the American Mining Congress and a delegate from the mining industry to NTTCIW.

### Schaffner Mfg. Co., Inc. Opens Cleveland Office

*Schaffner Mfg. Co., Inc.*, announces the opening of a Cleveland office. *Robert J. Pinchot*, a factory representative who has been calling on accounts in the Cleveland area for several years, will be in charge of the new office. Mr. Pinchot has been in the metal finishing field for many years and is fully qualified in the working applications of the firm's metal finishing products.

Robert J. Pinchot

Mr. Pinchot's Cleveland office will be at 2614 Grovewood, Parma, Cleveland 29, Ohio. Phone—Shadyside 9-6220.

### Carbic Color Changes Name

*Carbic Color & Chemical Co., Inc.* has changed its name to *Carbic-Hoechst Corp.* The company will handle all dyes, pigments and textile auxiliaries made by *Farbwerke Hoechst, A.G.*, of Frankfurt, West Germany, *Hoechst Chem. Corp.*, of West Warwick, R. I., and *Durand & Huguenin*, S.A., of Basle, Switzerland.

### Crystal Essence Corp. Reorganizes

*William E. Decker*, consultant engineer, announces the reorganization of *The Crystal Essence Corp.*, at new quarters in Bound Brook, N. J. He has assigned some sixty five patents and processes to the firm, which specializes in pearl essence and structural color pigments for dispersion in plastics, inks, paper, cloth and leather coatings.

Officers of the company are *William E. Decker*, president, and *George W. Anderson*, treasurer. The chemical consultant staff consists of Dr. Decker, director, *Dr. Peter A. van der Meulen*, and *Dr. Yuril Lebedeff*.

### International Rectifier Opens Syracuse Office

A new district sales office has been


DEPENDABLE PPI PRODUCTS

PLATING RACKS
RUBBER DRUM LINERS
ACID CONTAINERS
ANODE HOOKS
FIBERGLAS TANKS
DUCTS & HOODS
PLASTIC COATED DIPPERS & PAILS
STEEL & STAINLESS STEEL TANKS
LEAD & PLASTIC LINED TANKS
POLYETHYLENE PAILS & CONTAINERS
FUME SEPARATORS
PLATE COILS
LEAD ANODES
DEGREASING SOLVENTS
SILVER BRIGHTENER

NEW • DURABLE • LIFETIME

PPI TITANIUM ANODE HOOKS

This New Titanium Anode Hook Is Almost Indestructible When Used With — Nickel, Chrome, or Acid Copper Plating Solutions

*Advantages that will save you money . . .*

- No chemical or electrochemical attack on titanium hooks by plating solution
- No foreign metal to contaminate solution from the titanium hooks
- Titanium hooks can be placed completely under plating solution level . . . thus, minimizing scrap loss
- Hook threads will not decompose in plating solution
- No electrolysis on the surface of titanium that is exposed to the solution; therefore, hooks will not generate gas or decompose brighteners

NOTE: Titanium metal can't be used in cyanide or fluoborate solutions

Titanium Anode Hooks are made of ⅜" square stock in 3½" thru 8" graduated lengths to fit 1½" dia. anode rod size or less. Special size hooks quoted upon request. PPI makes a complete line of anode hooks . . . Write today for prices and complete details.

PATENT PENDING

*A Few PPI Territories Open For Distributors . . . write for details*

PLATING PRODUCTS, Inc.

1509 N. WASHINGTON
KOKOMO, INDIANA

David Conrad

opened in Syracuse, N. Y., by *International Rectifier Corp.*, El Segundo, Calif. The new office, located in the Paikan Building, 2366 James St., was formed to complement the company's New York City district office, and better serve the needs of New York State industry.

Named as sales manager of the new facility is *David Conrad*. A graduate of Wooster College, Conrad subsequently obtained a master's degree from the University of Pittsburgh. His background includes work as a semiconductor specialist and sales engineer in the Eastern and Western states, before coming with the firm.

### Diamond Alkali Opens New Plant

*Diamond Alkali Co.* placed into operation its 20% chlorine-caustic soda plant expansion at Deer Park, Texas, recently. The start-up of the new plant was timely in relation to gradually improved demand for chlorine and caustic soda this year. The initial operating rate of the new facility will be in excess of 50% of capacity.

The new facility brings the aggregate capacity of the company's entire Deer Park Works to a nominal 750 tons per day of chlorine with a concurrent capacity of about 825 tons of caustic soda and 7,500,000 cubic feet of high purity hydrogen.

### Kolene Corp. Appoints National Sales Manager

*William P. Ziegler, Jr.*, has been appointed national sales manager of *Kolene Corp.*, Detroit designers and manufacturers of molten salt bath equipment and processes used in a wide variety of metal cleaning applications.

Ziegler has been with the firm since 1949. He is a member of the American Society for Metals and the Engineering Society of Detroit.

### Facilities Extended at Don Blum & Co.

*Don Blum & Co., Inc.* have moved their sales office and warehouse to new and larger quarters at 1160 Lexington Ave., Rochester 6, N. Y., telephone GLenwood 3-8310.

*Fred Thiem* has also joined the staff as sales and service engineer.

### Vereeke Elected President of Heil

*Edwin W. Vereeke*, formerly executive vice president, has been elected president of *Heil Process Equip. Corp.*, manufacturers of corrosion resistant ventilating equipment, tanks and tank linings, etc., succeeding *Carl E. Heil*, founder and former president, who was elected Chairman of the Board of Directors.

Vereeke graduated from Ohio Wesleyan University in 1943. After doing graduate work at Western Reserve University, and serving in the Navy, he joined the firm as an estimator in 1946. He became sales enigineer in 1948, sales manager in 1950, vice pres.-sales in 1952, and executive vice pres. in 1954.

Vereeke is a member of the Cleveland Athletic Club; the Cleveland Engineering Society; the Sales Executive Club; and also the National Association of Corrosion Engineers, having been a charter member and past president of its Cleveland chapter.

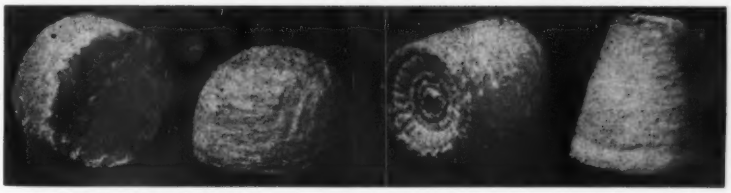
Edwin W. Vereeke

### Bailey Appointed to New ASARCO Sales Post

*Ralph W. Bailey* has been named assistant general sales manager of the Federated Metals Division of *American Smelting and Refining Co.*

Mr. Bailey will retain his present position as sales manager of the Continuous-Cast Products Department. A native of Coshocton, Ohio he joined the company in 1945 as a sales engineer for continuous-cast products at Perth Amboy, N. J. In 1950 he was made district sales manager of the department, operating from Whiting, Ind.


**BUFFS FOR INSIDE POLISHING**



GOBLET BUFFS, TAPER BUFFS, CYLINDER BUFFS, SMALL POLISHING WHEELS, RAZOR EDGE BUFFS, and many others for deburring, polishing and grinding any internal contour.

Write for additional information or contact your local dealer. These buffs are stocked by many dealers throughout the country.

We manufacture a COMPLETE LINE OF BUFFS including full disc loose and sewed buffs and polishing wheels. Our metal center BIAS TYPE BUFF may help cut your polishing costs.

Your request on your letterhead will bring our complete catalog by return mail.

**BARKER BROTHERS INC.**

ESTABLISHED 1911

1660 Summerfield Street — Brooklyn 27, N. Y.

Canadian Distributor — LEA PRODUCTS COMPANY, Montreal

Ralph W. Bailey

He returned to Perth Amboy in 1955 as sales manager of the department. His new post will bring him to New York.

A 1934 metallurgy graduate of Yale University, Mr. Bailey received a master's degree in engineering and metallurgy from the University in 1936. Prior to his association with Asarco he was a metallurgist with Scovill Mfg. Co. and United Aircraft Products.

### H-VW-M Names Harper and Roney

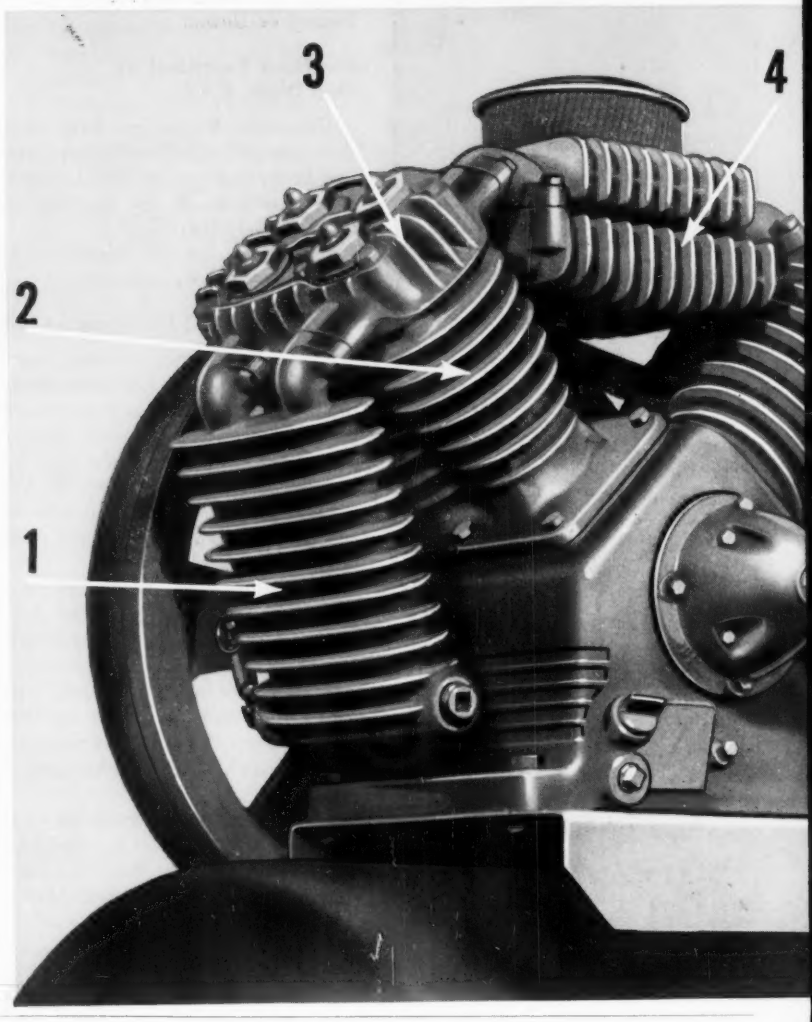
*Willard J. Harper* has been named chief engineer at *Hanson-Van Winkle-Munning Co.* In this capacity he will be in charge of all equipment design and engineering for the company's extensive line of automatic metal finishing machinery.

Prior to his appointment, Harper was the company's chief mechanical engineer. In this capacity he was in charge of all mechanical design engineering. He joined the firm in 1957. A mechanical engineering graduate of the University of Kentucky, Mr. Harper's previous experience has been with the hydraulic drives department of Westinghouse Electric Corp. where he was section manager. He was associated with Hughes Aircraft Co. involved in the development of hydraulic components and systems for missile components.

*David M. Roney, Jr.* has been appointed sales manager-Equipment Division. Prior to this appointment, he was assistant sales manager with the company, concerned with the management, coordination and advancement of the mechanical and electrical equipment.

Roney, a U. S. Naval Academy graduate, served with the Navy nearly five years. After this service he attended the University of Pennsylvania Law School. Previous to joining H-VW-M, Mr. Roney had been associated with Bendix Aviation Corp. as sales engineer and Westinghouse Electric Corp. as application engineering manager. He joined the firm in 1955.

## More finned cooling area makes




### Promotions Announced by Diamond Alkali Co.

Several promotions of veteran employees of *Diamond Alkali Co.'s* Chromium Chemicals Division to key positions within the division were announced recently. They are the result of the death of *Walter W. Cooke*, general superintendent of the division plant in Painesville, O., who was killed in an automobile accident June 12.

*A. W. Waller*, manager of the division's Kearny, N. J. plant, becomes operations manager of the division at both Kearny and Painesville, where chromium chemicals are manufactured. *George Henderson*, assistant plant manager at Kearny, succeeds Waller and becomes general superintendent at Kearny. He will report directly to Waller.

*George Barbieri*, special staff assistant at the company's Cleveland headquarters office, becomes general superintendent of the division's plant at Painesville, the position held by the deceased. He will report directly to Waller.

# DeVilbiss compressors more efficient

1. Finned Intercoolers
2. Finned Cylinder Walls
3. Finned Cylinder Heads
4. Finned Aftercooler
5. Finned Check-Valve Manifold

The cooling system of a compressor makes a big difference in operating efficiency. The hotter the air delivered into the tank, the greater the shrinkage when it cools. A cool-running compressor delivers low-temperature, less-expanded air to the tank, resulting in fewer running cycles for any air demand.

DeVilbiss compressors with their greater finned cooling area deliver air to the tank at lower temperature. Result: less air shrinkage in the tank, less frequent running cycles, less power consumption.

Notice the finned, cast-iron intercoolers (1), with large-capacity chambers which retard velocity of air to permit a longer cooling cycle between compressing stages. Deeply finned cylinder walls (2) and heads (3), for rapid, thorough heat dissipation. Finned aftercooler (4), that lowers temperature further before air enters tank. Even the check-valve manifold (5) is finned for maximum aftercooling.

Send for Catalog C-51, or call the local DeVilbiss representative for all the facts.

THE DE VILBISS COMPANY
TOLEDO 1, OHIO
Barrie, Ontario • London, England
São Paulo, Brazil
*Branch Offices in Principal Cities*

FOR BETTER SERVICE, BUY
DE VILBISS

Edward Herzig

metal cleaning compounds and other preparation formulations for the metal finishing industry, has appointed *Edward Herzig* to its technical staff in the capacity of research and development chemist.

Mr. Herzig is a graduate of Rutgers University, and did his graduate work at Polytechnic Institute of Brooklyn. He has had a number of years experience in the precision plating of numerous precious metals, plating of plastics, etc. He was formerly supervising chemist, in charge of plating, with Seaboard Laboratories and the Electro-Tec Corp. He is a member of the American Chemical Society, American Electroplaters' Society, and American Society for Metals.

### Magnus Chemical Co., Inc. to Represent Perfecto-Peen

*Magnus Chem. Co., Inc.*, Garwood, N. J., has been appointed a sales representative by *Perfecto-Peen*, Division of Aero-Test Equipment Co., Dallas, Texas, for the states of Connecticut; Delaware; Maine; Maryland; Massachusetts; New Jersey; New Hampshire; New York; Pennsylvania; Rhode Island; Vermont; Virginia and West Virginia.

### Oakite Transfers, Appoints Representatives

Two transfers and two new appointments in its technical field service organization have been announced by *Oakite Products, Inc.*, manufacturers of specialized chemical compounds for industry.

*Ben P. Fortin*, a veteran of almost twenty years service, formerly assigned to Tyler, Tex., has joined the staff in

*Matthew A. Killinen*, assistant superintendent at the Painesville plant will be assistant general superintendent at Painesville.

To his new post Waller brings 42 years of highly diversified and specialized experience in the chrome chemicals field. He started at the Kearny plant, then the Martin Dennis Co., in August 1917 as assistant superintendent, becoming plant manager in 1948.

Henderson likewise is a veteran in the chrome chemicals field who started in October 1925 as a maintenance mechanic with Martin Dennis in Newark, transferring to Kearny in 1940 as assistant superintendent. He became superintendent in 1947 and assistant plant manager in 1954.

Barbieri joined the organization in August 1946 following four years of service with the U. S. Coast Guard. He was successively promoted from a division clerk to office manager in 1948, to maintenance superintendent in 1955 and special staff assistant in 1956.

Killinen's service dates back to February 1930, when he joined the firm as head of the Magnesium Chloride Department. He transferred to the Chromium Chemicals Division at Painesville in 1945.

### Gumm Appoints Herzig to Technical Staff

*Frederick Gumm Chem. Co.* of Kearny, N. J., manufacturers of special

Ben P. Fortin

Los Angeles, where he will serve the metal industries. His post in Tyler has been filled by *Henry L. Jones*.

*J. G. "Jerry" Hickey*, has been transferred from San Francisco, where he has served since 1954, to Sacramento, Cal.

*Wayland E. White* has been appointed to the Corpus Christi territory. Both Mr. Jones and Mr. White came to the firm with considerable experience in cleaning service. Before undertaking their new assignments, they completed an intensive eight-week training course at the company's New York laboratories and in the field.

### Donohue Joins Hubbard-Hall

*Hubbard-Hall Chem. Co.* has appointed *John J. Donohue* to the sales staff of its Industrial Chemical Division. Donohue was formerly New England Representative of Wilson Martin, organic chemicals distributors. In his new position Donahue will serve Connecticut firms with the complete line of industrial chemicals.

### Vanderveer New President of Circo Equipment

*Wellington Vandeveer* will take over the post of president, it was announced by the *Circo Equipment Co.*, Clark, N. J., one of the nation's leading manufacturers of metal degreasing and washing equipment. He succeeds *Melville Morris*, who has resigned from the company.

Vandeveer was formerly sales planning manager for Merck & Co. He has also been connected with the management consultant firm of Booz, Allen and Hamilton. He is a graduate of Williams College ('39).

At the same time, *Severn Carlson* was named to direct sales activities for both Circo and the newly formed subsidiary, *Circo Ultrasonic Corp.* He has been a sales engineer with the firm for five years; prior to that he was a

Wellington Vandeveer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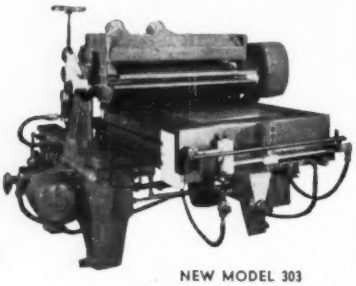

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product engineer with Wallace and Tiernan for six years. He is a graduate of Lehigh University ('48).

The company also announced the appointment of *Benson Carlin* as executive vice-president of the subsidiary. Carlin is a national authority in the ultrasonics field and was formerly head of Alcar Instruments, Inc.

### New Distributors for Hydra-Blast

*Waldron Co., Inc.*, North Haven, Conn., has been appointed distributor for *Hydra-Blast* equipment and products in the New England states.

*General Supply & Equip. Co.*, 15583 Brookpark Road, Cleveland 11, Ohio has also been appointed distributor.

### Amchem Holds Outstanding European Convention

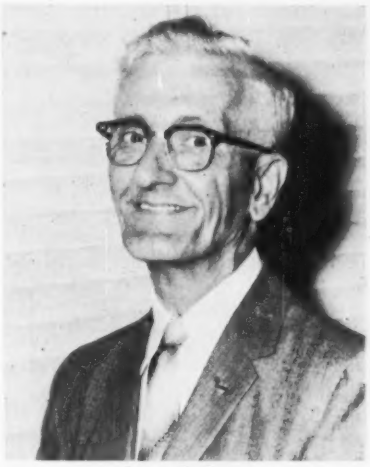
*Amchem Products, Inc.* of Ambler, Pa. has completed a five-day European Convention held at the Imperial Hotel, Copenhagen, Denmark, May 31 through June 4. Over 100 foreign licensees and their wives were in attendance representing Austria, Belgium, Denmark, England, Finland, France, Germany, Greece, Holland, India, Israel, Italy, Norway, South Africa, Spain, Sweden and Switzerland.

The following representatives covered for the three company divisions: *Leon Cherksey*, chairman of the board, *John O. J. Shellenberger, J. I. Simpson, J. H. Geyer, J. R. Sterry* and *S. E. Sasse*.

### Speakman Co. Honors Fifty-Year Man

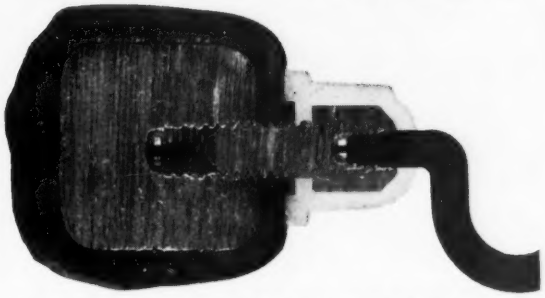
*James F. Green* was recently honored by *Speakman Co.* at a dinner celebrating his fifty years of service with the firm.

Retiring because of his health, Mr. Green has been foreman of the plating



James F. Green


LEAK-PROOF!



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department. When he started as a helper at the age of 14, there were only two workers in that department. He recalls that in the early years everything was cleaned by hand, with sawdust on the floor to soak up the water.

Mr. Green was a member of the Philadelphia Branch of the A.E.S. from 1925 to 1956. He is also a member of the Men's Bible Class of Siloam Methodist Church. Mr. and Mrs. Green have three daughters and eight grandchildren.

**Kushner Electroplating School Moves to Larger Quarters**

The *Joseph B. Kushner Electroplating School*, home of the well known "Electroplating Know How" correspondence course in modern electroplating and metal finishing, has moved its offices to 621 S. Norman, Evansville 14, Ind. Its mailing address will remain as before, Box 2066, Evansville 14, Indiana. The move to larger quarters was made necessary by the acquisition of new equipment for printing of student lessons and the need for additional space to store and handle student records.

The school also wishes to announce to the industry that for the first time in eleven years it will be closed down for a vacation period this summer. The vacation period will be during the last three weeks of August and the first week of September.

## News from California

By Fred A. Herr

*Morton Schwartz*, senior research chemist for Kelite Products, Los Angeles, has been appointed instructor of a night school class in electroplating and allied subjects which is scheduled to begin at Woodbury College, Los Angeles, on September 17.

Schwartz succeeded *Mitchell Raskin* who served as instructor of plating classes at the University of California at Los Angeles and later at Woodbury College for some 12 years. Raskin recently assumed a position in the San Francisco area.

Schwartz announced that the class will be held in two semesters, so designed that they may be taken individually or together. The first semester will be conducted from September 17 until mid-January with classes held on Wednesday night of each week from 7 to 9:30 o'clock. The second semester is scheduled for the mid-February to June, 1960, perjod.

Basically, the instruction to be offered will include the fundamentals of chemistry, the principles of electroplating, study of solutions and their applications from brass to zinc, precious metal plating, anodizing, and the principles of printed circuitry. A special course in which printed circuitry will be treated in more extended form is also being offered at Woodbury College.

Schwartz announced that the course he directs will be designed so that it will appeal to experienced platers who


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wish to brush up on new developments, as well as novices just starting out.

---

*Marty Barsoon*, 45, plating department supervisor for the Whittaker Co. in Lynwood, Calif., died in mid-May of a heart attack. He was a member of Los Angeles Branch of the A.E.S.

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*Theodore Roter*, 18-year-old son of *Meyer Roter*, operator of Artcraft Plating & Finishing Co., Burbank, Calif., took off on June 14 with two school mates for a three-month tour of the continent of Europe. The trip is in the nature of a present from his father for the outstanding grades Ted achieved during the past school year at North Hollywood High School. Ted expects to matriculate at Valley Junior College this fall; but whether he will major in electrochemical engineering or electronics, the fields in which his father achieved outstanding success with his plating firm, is still undecided, according to Meyer.

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Anodized aluminum panels provide a colorful note in the construction of the Federal Savings & Loan Association's new 12-story office building in Hollywood, Calif.

The curtain-wall of the building is composed of 800 gold-anodized aluminum panels, framed with black anodized mullions. Anodized aluminum also figures in the horizontal sunshades which extend the length of the building at each floor level. The sunshades consist of natural-finish and gray anodized aluminum. The ends of the sunshades are fitted with decorative panels of red, yellow and green porcelain-enameled aluminum.

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Beckman Instruments, Inc., Fullerton, Calif., has announced the appointment of *Richard C. Erbes* and *Frank Kelly* as product line managers of the firm's scientific and process instruments division.

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*Carl Soderland*, consulting engineer from the Worcester, Mass. main office of the Norton Co., directed a forum on abrasives and grinding at the Los Angeles plant of the Garrett Supply Co. in May.

The forum was held on four successive nights. It drew an attendance of several hundred persons from Southern California industrial plants. Discussions and demonstrations of the forum were directed mainly at the purchasing and supervisory shop levels.

In the principal talk, Soderland discussed the latest wheel dressing and grinding techniques and how they can be adapted to problems presented by today's increased metal hardness and production requirements. A talk was also given by *Robert Hamilton*, abrasive engineer for the company in the Los Angeles area. A film dealing with the historical background of abrasives was shown as part of the program.

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Past-Presidents' Night, held June 10 as part of the monthly meeting of the Los Angeles Paint & Varnish Production Club, was featured by the presence of twelve former presidents. These ranged from *H. P. Reading*, who headed the club in 1932-33, to *F. Martin*, the 1957-58 president. The evening was also proclaimed "Boss' Night." The presidents of eleven Southern California paint and varnish manufacturing firms were introduced.


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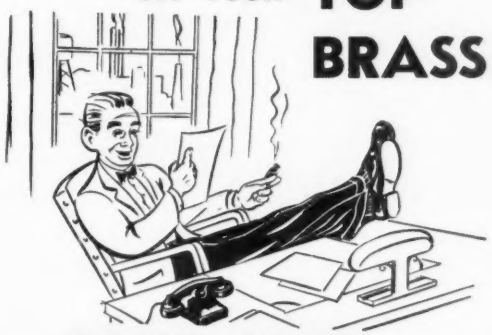

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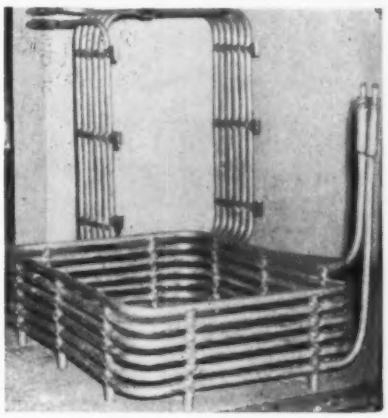

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*Charles Finegan*, chairman of the educational and technical fund committee, reported that a trust fund was being established to sponsor research educational activities in the coating field.

The speaker of the evening was *James Stanton*, technical service manager for Cargill, Inc., Los Angeles. His talk dealt with "Oil Modified Polyurethane Coatings." He outlined the five chief commercial uses of urethane coatings as two package systems, blocked isocyanate, one package systems, the amine or cobalt catalyst system, and the oil-modified polyurethanes.

Mr. Stanton then presented data comparing the oil modified polyurethanes with alkyds and epoxy esters. Urethane oils, he said, excel for mar resistance and have an advantage for speed of dry and hardness.

---

*Pacific Electro-Sales, Inc.* has been appointed industrial sales representative for *International Rectifier Corp.* in the San Diego area.

The new representative is located at 1465 Deerhill Court, LaJolla, Cal. Manager of the firm is *Fred W. Falck*, previously president of the Advance Electric and Relay Co. Falck's background includes 20 years in sales and management serving component users in Southern California and throughout the United States.

Fred W. Falck

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Details released about a new continuous annealing and pickling line recently installed in Calstrip Steel Corp.'s Los Angeles plant reveal it to be one of the most versatile lines on the West Coast for processing stainless steel strip.

The setup is reported to be designed to provide stainless steel strip with clean, bright finish, having an easy buffing quality and high corrosion resistance. Line capacity (which is operated by two men) is 1250 pounds per hour of finished-grade strip and 1500 pounds per hour in heavier gauges. Facilities are designed to process strip up to 0.060" maximum thickness and 13" width. Line speeds vary from 7.65 to 51 f.p.m.

Among the equipment is a molten salt descaling bath in which the salt bath is held at uniform temperature with specially designed gas immersion tubes. The salt tank measures 17 feet, 9 inches in length, and holds 17,000 pounds of salt in a steel plate, insulated pot.

The three acid tanks are each 31 feet long, of steel plate construction, and lined with polyvinyl chloride. One is


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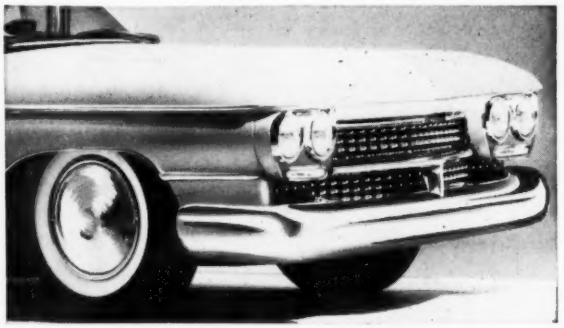


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**New West Coast Building for the R. C. Mahon Co.**

Artist's conception of the modernistic, 10,000-square foot, 2-story Western Division administration and engineering building *The R. C. Mahon Co.* of Detroit currently has under construction in Torrance, Calif., as part of a $3.5 million West coast expansion program. The stainless-steel-faced unit will be entirely separated from the 200,000-square-foot manufacturing plant, also being built on the 30-acre site, 12 miles south of Los Angeles.

## NEW BOOKS

**A Glossary of Pigments, Varnish and Lacquer Constituents**

*By J. H. Martin, Ph.D. and W. M. Morgans, Ph.D. Published by Chemical Publishing Co., Inc. 212 Fifth Avenue, New York, N. Y. (1959) as the first American Edition. 111 pages. Price: $3.50.*

The glossary consists of two sections, the first one covering pigments having 48 pages while the second one covering varnish and lacquer constituents having 62 pages. Descriptions of raw materials, processing steps, and intermediate and finished products that relate to these industries, including some of the more recent terminology and trade names, are included in this book.

Though the definitions and descriptions in numerous cases are much too brief to adequately describe the items in question for the user, there are many instances throughout the book where


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skillful condensation may be found. The book is a useful medium for rapid, spot check reference purposes. To the user who had at one time a more extensive knowledge of the subject, definitions such as are incorporated in this glossary should help him recall a fair amount of the eluded information.

The book is particularly valuable for beginners and students who plan to make varnish and lacquer making their career.

### Control in Electroplating

*Published by Robert Draper Ltd., 85 Udney Park Road, Teddington, Middelsex, England. 1959. 92 pages. Price: 15 shillings.*

This volume consists of four papers presented at a one-day symposium of the London Branch of the *Institute of Metal Finishing* in November 1958, together with the discussions which followed. The papers, by well-known authors, include chemical control of plating baths, examination of deposits, trouble shooting in the plating shop, and inspection and testing of deposit quality. The treatments are very practical and much valuable information is disclosed.

## Associations and Societies

### AMERICAN ELECTROPLATERS' SOCIETY

#### Chicago Branch

The June 5 meeting was held at the Western Society of Engineers, 84 East Randolph St. President *Charles Geldzahler* called the meeting to order and one application for membership was turned over to the Board of Managers for approval. *Ed Smith* gave a preliminary report on the "Golf-Outing" for the branch. The outing will be held on Friday, Sept. 25, at the Itasca Country Club, and the cost will be ten dollars including an excellent dinner.

Librarian *Simon P. Gary* introduced the speaker of the evening, *Ray Ledford*, whose subject was "Purification in the Plating Room." After a question and answer period. Mr. Ledford was given a rousing vote of thanks for his interesting and informative talk.

*Christopher Marzano*
Publicity Chairman

#### Los Angeles Branch

The results of a mail ballot undertaken in May to obtain membership opinion on a series of proposed amendments to the branch by-laws were presented at the June 10 meeting in Rodger Young Auditorium, Los Angeles.

President *George Hetz* reported that all 15 of the proposed amendments were approved. Approximately 20% of the membership total returned ballots. Approved were amendments which change the date of the branch's annual election of officers from the March to the April meeting, and a change in the fiscal year dates. A proposal allowing applicants for membership to be elected by proxy during their unavoidable absence, was also approved; as was also a proposal to eliminate from the by-laws a section providing for an exhibits committee. A proposal to increase branch dues,

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which was discussed at length at the May 13 meeting, was brought to a vote at the June 10 business meeting. The membership voted to increase Los Angeles Branch dues from the current $9.00 to $15.00 per year, effective July 1, 1959.

President Hetz declared that expected action at the Detroit convention which would increase the per capita tax from $5.70 to $10.00 was only one factor which influenced the need for higher dues in Los Angeles. With operating expenses increasing all along the line, Hetz said, a dues increase was necessary, irrespective of what the Supreme Society may do in respect to the per capita tax.

They were also instructed to make an effort to persuade the Supreme Society to allow the branches more time in forwarding the per capita tax to the national office. Various officers pointed out that, with no branch meetings being held in August, the treasurer is out of touch with the members and would find it difficult to get the per capita tax to the national office on the proposed September 1 date. Los Angeles delegates were instructed to plug for a continuation of the December 1 deadline for per capita tax payment.

A report by the chairman of the Handbook Committee revealed that the committee is making excellent progress in assembling the first technical handbook and membership roster which the branch has sponsored in more than a decade.

The handbook is expected to come off the press before the end of the year. It is intended for distribution to all branch members as well as to those attending the 1960 AES convention in Los Angeles in June, 1960.

The speaker was *Ernest J. Zeilberger*, supervisor of material engineering, North American Aviation, Inc. His subject was "Future Materials Requirements." Mr. Zeilberger was a member of the NASA Committee on Materials, from which experience he drew in giving Los Angeles members an idea on what future government requirements in materials may add up to.

## NATIONAL ASSOCIATION OF METAL FINISHERS

*A. T. Leonard*, president of Superior Plating, Inc., Minneapolis, was elected president of the NAMF, at the annual convention in Detroit. He succeeds *George W. Taylor*, president of Production Plating Co., Adel, Ga.

*Robert L. Giesel*, president of Adolph Plating Inc., Chicago, was elected first vice president, while *Edward N. Marlette*, president of Marlette Plating Co., Chicago, was named second vice president.

Re-elected to his fifth term as secretary-treasurer was *Frank Kaiser*, presi-


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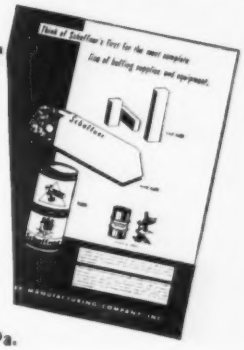

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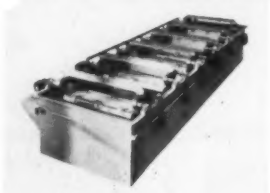
LAZO — The Pioneer Better Metal Finishing



LAZO Model 2-SHSD . . . 6 Barrel Heavy Production Unit . . . Motorized

Size: 14"x36" inside cylinder dimen.
Size: Overall: 205"x63"x39" high
Tank: 202"x51"x30" high
⅛" Standard Perforations
Any Type Parts up to 4" dia.
All Plating Solutions
Holds up to 175 lbs. per barrel

Especially adaptable for cycle plating through electro-cleaning and acid-pickling. S-lid copper saddles for positive current-carrying capacities. Equipped with 6 side-drive Model 2-SHSD Lucite Barrels. Each barrel driven by its own heavy duty gearhead motor, mounted on outside of tank. Required anode and cathode bus bar connections. Quick loading and unloading through each barrel door. Equipped with motor starters.

*Originators of Ribless Plating Barrels*

HARDWOOD LINE MFG. CO.
2022 N. California Ave., Chicago 47, Ill.

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CHEM-SALTS, INC.
P.O. BOX 2803, STATION D
ATLANTA 18, GEORGIA
and
P.O. BOX 790
WATERBURY 20, CONN.

A. T. Leonard

dent of Long Island Mechanical Plating Co., Inc., Woodside, L. I., N. Y. *Sal Novelli*, partner of Service Plating Co., Brooklyn, N. Y., was named assistant secretary-treasurer.

Two new directors were elected. They are *James E. Cogan, Jr.*, president of Globe Electroplating Co., Philadelphia, and *Charles T. Smith*, works manager of Danbury Metal Finishing Co., Danbury, Conn.

### Manufacturing Jewelers & Silversmiths of America, Inc.

The Convention and National Industrial Exposition of jewelry, silverware and allied product manufacturers will be held on October 14, 15 and 16, 1959 at the Sheraton-Biltmore Hotel in Providence, R. I.

There will be a program of trade seminars, meetings and panel sessions during the three-day event. Subjects under discussion will include credit and financing, product diversification, packaging, shipping, designing, and technical subjects including electroplating and product control techniques.

Additional information may be obtained by writing to *Olof V. Anderson*, Chairman, Executive Committe, c/o the Sheraton-Biltmore Hotel.

## OBITUARY

### EARL H. KIRKPATRICK

It is with profound sorrow that we announce the death of *Earl H. Kirkpatrick*. He was the founder of *E. H. Kirkpatrick & Son, Inc.*, an industrial electroplating firm of Kingston, N. Y.

WONDERFUL HELP

"Your course has been a wonderful help to me. I use your books almost every day in my work," writes plating foreman Hugh Wolfe of Cape Girardeau, Mo. You too, will find ELECTROPLATING KNOW HOW a wonderful help if metal finishing is your business! Write Dr. Joseph B. Kushner, Electroplating School, Box 2066, Evansville 14M, Indiana, *today!*

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### Money Saving Prices
### Immediate Delivery

✦

**50—Assorted Plating Barrel Units, Standard Makes for all solutions.**

50—Various Sizes Heat Exchangers, Stainless, Lead, Carbate, Steel. All sizes, with pump units.
25—Assorted full automatic rotary Buffing, Polishing & Deburring Machines, Divine, Hammond, Packer, Acme, etc. tables from 20" to 72" diameter, with 3, 4, 5 and 6 heads.

**400—Assorted plating rheostats, double pole reversing switches, from 10 amp. up to 5000 amps.**

30—Semi-Automatic — single to eight spindle machines, Hammond, Acme, Divine, Automatic, etc.
300—Assorted buffing and polishing machines from 1 HP to 50 HP single and double end spindles, including some variable speed types.
300—Assorted size wood, steel, rubber, plastic, lead lined and stainless tanks up to 30 ft. long.

## BUY OF THE MONTH

**100—Sturgis, Roto Finish, Baird, Crown, Belke, Abbott, Henderson and other makes of tumbling, cleaning and burnishing barrels.**

1—HVWM 4 Station Plating Unit 36 x 14 Cylinder — for nickel & cyanide.
1—HVWM 6 Station Plating Unit, all tanks for cleaning cycle.
10—Semi automatic plating machines, 10 ft. to 35 ft. long for nickel, copper and chrome.
5—Industrial Filters, RDR-2, 36 x 3630, for nickel, complete.
100—Various sizes rectifiers from 25 amp. to 5000 amps. Selenium, Germanium, all complete with controls.
90—Various size Generator sets from 50 to 10,000 amps. Chandeysson, Hanson Van Winkle Munning, Bogue and other standard makes, all complete with panel boards, starters, etc. voltage range 2 volts up to 100 volts, for all purposes.

**• STagg 2-2022 •**

**J. HOLLAND & SONS, INC.**
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1—H-VW-M Mtr. Gen. 750/A—8 V.
1—American Giant 750 amps. 6 volts
3—Udylite rectifiers 1500/750 amp. 6/12 V.
2—R-A 500 amp., 6 V. with control.
3—G. E. 500 amps. 6 volts with control.
1—Rapid 300 amps. 6 volts with control.
1—Udylite 500 amps. 6 volts with control.

**SEMI-AUTOMATIC PLATING MACHINES**
5—From 12' to 32' long for nickel and cyanide.

**PLATING BARRELS**
2—Daniels #3.
3—Lasalco steel 36 x 18 Lucite cylinder.
1—Lasalco rubber lined 30 x 15.
1—H-VW-M steel 36 x 18.
1—Udylite steel—42 x 15.
2—Udylite multi-purpose barrel — hard rubber cylinder.

**FILTERS**
10—Industrial, Alsop, Sethco — all sizes — nickel and cyanide solutions.

**TUMBLING BARRELS**
2—Abbott barrels, variable speeds.
1—#2H Baird poliaction Tumbler.
10—Baird barrels 2C tilting type.
8—Henderson barrels 5A tilting type.
4—Globe barrels.

**POLISHING MACHINES**
1—Production Machine #101 — 7½ H.P.
4—#101 Tandum 15 H.P.
2—Production Machine #484-2.
5—Acme A2.
3—Acme B10.
2—Divine Model VM-10 — 10 H.P.
2—L'Hommedieu 5 H.P. variable speed.
15—Holland 5 H.P. — 7½ H.P. — 10 H.P.
1—Acme L-82 — 7½ H.P.
4—Gardener 5 H.P. — 7½ H.P.
6—Divine Idlers.

**DRYERS**
1—Ronci R100.
2—Barrett centrifugal dryers.
2—Kreider #12 steam explosionproof m'rs.

**BOILERS**
Kane gas fired 20 H.P., 7½ H.P.

**RHEOSTATS** — all sizes

**MISCELLANEOUS**
1—Detrex alkaline belt washer.
1—Philips electric degreaser.
1—Blakeslee pump type washer.
Blowers and motors—multivain (fume) paddle wheel (dust).
1—Blakslee washer.

**TANKS**
300—All sizes — all linings.

**COMPLETE PLANTS PURCHASED — SURPLUS EQUIPMENT WANTED.**

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**EQUIPMENT AND SUPPLY CORP.**
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1—7500/3750 AMPERE 9/18 VOLT. **H-VW-M,** Synch.
1—7500/3750 AMPERE, 6/12 VOLT, 25°C. **CHANDEYSSON,** Synch.
1—6000/3000 AMPERE, 6/12 VOLT. **ELECTRIC PRODUCTS,** Synch.
1—5000/2500 AMPERE, 12/24 VOLT. **CHANDEYSSON,** Synch.
2—5000/2500 AMP., 9/18 V., 25°C., **CHANDEYSSON,** Synch. Exciter-in head.
1—5000/2500 AMPERE, 6/12 VOLT, 25°C. **CHANDEYSSON,** Synch.
1—4000/2000 AMPERE, 6/12 VOLT. **H-VM-M,** Synch., Exc.-in-head.
3—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—2000/1000 AMPERE, 6/12 VOLT. **H-VW-M.**
1—1500/750 AMPERE, 12/24 VOLT. **CHANDEYSSON,** Synchronous.

**ANODIZERS**
1—1000 AMPERE, 40 VOLT. **CHANDEYSSON,** 25°C.
1—1000 AMPERE, 30 VOLT. **IDEAL,** Exciter-in-head.
1—500 AMPERE, 25 VOLT. **CHANDEYSSON,** Synchronous, Exciter-in-head.
2—400 AMPERE, 40 VOLT. **M.G.C.,** Separately Excited.

**RECTIFIERS**
1—**G. E.** 2000/1000 AMP., 6/12 V.
1—**SEL-REX** SELENIUM, 1200 AMPS. 9 V. for 440/3/60.
2—1500/750 AMPERE, 6/12 VOLT, **UDYLITE-MALLORY.**
1—**NEW G. E.** 2000/1000 AMPS, 6/12 V. Remote Control 440/3/60 AC.

**SPECIAL**
1—**MODEL A** Production Pipe Polisher. Vertical. Abrasive Belt Model.
2—**CROWN & H-VW-M** Centrifugal Driers No. 1 and No. 2 with Heat.
2—**MERCIL** Ball Burnishing Barrels, Sizes 1 and 2.
3—**LASALCO** Ball Burnishers, Sizes 1, 2 & 4.
1—**HAMMOND** 7 VRO Vari-speed 7½ H.P. Buffing Lathe.
1—**L'HOMMEDIEU** 5 H.P. Variable Speed Buffer, Model 18.
3—**INDUSTRIAL** RDR-1 Rubber-Lined Filters. Sizes 10x28, 18x28, 14x36.
10—BUFFING LATHES — **HAMMOND, DIVINE, U. S.** etc. from 3 H.P. to 20 H.P.
2—**INDUSTRIAL** Type SC Filters for Cyanide. 18x48 and 18x36.

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1—Hammond Model #50 Polishing Table w. 4-10 H.P. Heads.
1—Udylite 76' Return Type Extrusion Polisher w/ 7-10 H.P. & 3/5 H.P. Heads.
1—Acme L-8-L with 3 Heads.
1—Packermatic 60" Table 12 Spindles 7 Heads.
1—Hammond 30' Reciprocating Table, 15 H.P. Head.
11—Acme G-3 144" Belt Sanders.
5—Acme G-1 Universal 5-15 H.P.
2—Acme G-1 Special Bumper Heads 15 H.P.
35—Murray Way 55 & 60 Series Heads & Sanders. $250-$500.00.
1—20' Semi-Automatic rubber lined tank vari-speed.
1—Acme 30' St. Line Pol. Table.
2—Production 101 w/10 or 15 H.P. Motor.

**SEMI-AUTOMATICS**

1—Automatic Machine Co. 4 Spindle—Like New.
2—Automatic Machine Co. 8 Spindle.
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1—Automatic Machine Co. 2 Spindle for out of round work.
1—Automatic Machine Co. 1 Spindle Oscillating with Right Angle Attachment.
15—Automatic Machine Co. Single Spindle with 6" Oscillation.
All Replacement Parts for all Above Machines in stock.
Large Stock of Chucks & Special Attachments & Work Holders.

**POWER EQUIPMENT**

1—6000/3000 A. 6/12 V. Chandeysson (Synch.).
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1—750 Amp. 60 V. Star Kimbell.
1—1660/880 Amp. 6/12 V. G.E.
1—18 Volt, 500 Ampere Placo Selenium, w/full control.
5—12/6 Volts, 1000/2000 Amperes G. E.
1—G. E. Automatic Voltage Controller, 6000 Amperes.
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New Replacement Stacks for Udylite $285.00.
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10—6 Volts, 500 Amperes New G. E. Copper Oxide.
Replace your burnt out Copper Oxide Stacks $175.00 for Stack & Kit.
10—New G. E. Controls.
10—G. E. Controls 1-4 Units of 500 Amperes.
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6—6 Volts, 300 Amperes G.E. W/New Selenium Stacks & Control.
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2—6 Volts 100 Amperes W/Controls.
2—6 Volts to 15 Volts, 50 Amperes, W/Controls.
2—6 Volts to 10 Volts, 25 Amperes, W/Controls.
11—New 125 Amp. 6 volt generators.

**MISCELLANEOUS**

1—5 H.P. Divine Variable Speed.
1—7½ H.P. Hammond Variable Speed.
9—Jewelers Polishing Tables, Comp.
3—U.S. #95 5 H.P. Variable Speed.
10—Assorted Abbott Steel & Steel Rubber Lined Tumblers.
7—#1 Baird Motorized Tumblers, w/New Wood or Steel Barrel.
3—#2 Baird Motorized Tumblers w/New Wood or Steel Barrel.
2—Henderson #5 & 5A Tumblers.
15 ton York Heating & Cooling unit complete.
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Industrial Filter 3'x5' RDR-2 w/slurry tank.
Hammond OD-9 w/10 H.P. motor.
1—Hammond double 7½ H.P. Pol. Mach. like new, model 7-RROWB.
2—3 H.P. Hisey-Wolf vari-speed polishing machs.
Crown 12" steam heated centrifugal dryer.
2—New 6' x 3' Loylite Hoods for exhaust chrome tank.
Acme Straight Line Buffing Conveyor, oval shaped approx. 30' w/Comming Devices.

**POLISHING ACCESSORIES**

Spindles, Nuts, Washers, Spacers, Wrenches, Spinners in Stock.

**Plating, Polishing, Grinding, Spraying, Baking, Drying, Tumbling, Cleaning, Degreasing & Anodizing Equipment. Anodes, Chemicals, Acids, Cyanides, Solvents, Supplies for Wood, Plastic and Metals.**

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**75 Wythe Ave. Brooklyn 11, New York**
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## *Better Equipment*

**Rectifiers**

6—12/24 Volt—1,500 Amps.—late model Udylites.

**Generator Power Available From 30¢ per Amp. and up**

1—8/16 Volt—20,000 Amps.
1— 11 Volt—10,000 Amps.
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1— 6 Volt— 6,000 Amps.
2— 8 Volt— 3,000 Amps.
1— 6 Volt— 3,000 Amps.
1—6/12 Volt— 1,500 Amps.
1—9/18 Volt— 1,500 Amps.

**Filters**

6—18x48x40 Type SCW-2—Industrials.
3—36x36x30 Type SCW-2—Industrials
2—36x36x30 Type RDR-2—Industrials.
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1—20 ton refrigeration — Frigidaire.
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All sizes — rubber and Koroseal lined tanks.
All sizes — steel tanks.
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*Samples sent*

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## *ONE OF A KIND*

**Used Crown Unitmatic Partially-Automatic Constant Agitation Type RUBBER LINED PLATING MACHINE.**

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**SPECIFICATIONS:**

30 feet long.
6 feet wide.
4 feet deep
Variable speed.
34 hanger arms.
18" hanger center to center.
15" center of anode rod to center of hanger.

**EXCELLENT CONDITION BUILT NEW IN 1956**

**NEW ACQUISITION COST — $7647.00**

**OUR PRICE — $4500.00**
**F.O.B. Chicago, Ill.**
**Loaded on truck.**
**Immediate Delivery**

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**IMPORTANT FEATURES**

1. Reciprocating motion agitation.
2. Bus for high current density.
3. Plating 4 min. to 6 hours.
4. ¼" double welded tank.

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(not actual photo)

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**Franklin 2-3538**

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Sacrifice at ⅛ original cost of installation. Complete modern facilities 12,000 sq. ft. for copper, nickel and chrome plating. Ready to go. Will handle 6' O" work. Four budget hoists on overhead monorail in continuous 250' oval. 30 h.p. boiler; 1—2500 A 6 V Gen; 4—500 A 6 V Rect; 1—4000 A 6 V Rect; 2—500 A 6 V Rect; 2—1500 A 6 V Rect; 15 h.p. air compr. 13' tank Nu-Brite Nickel; 12' Nickel tank; 7' chrome tank; many cleaning, pickle and rinse tanks. Degreaser, tandem tube polishing machine; 3 head 10 h.p. Acme automatic; 2 L-4 semi's; 1 hand polishing machine with backstand; 3000# Clark tow motor, many racks, lab equipment, time clock, filters, fans, small tools. Address: August 1, care Metal Finishing, 381 Broadway, Westwood, N. J.

## PLATING GENERATORS FOR SALE

3—10000/5000 Amp., 6/12 Volt Chandeysson MG Sets, Direct Connected Exciters, Panels and Starters (1948). Like New.

1—10000/5000 Amp., 9/18 Volt Chandeysson MG Set, Direct Connected Exciter, Panel and Starter (1952). Like New.

1—10000/5000 Amp., 6/12 Volt H-VW-M MG Set, Panel and Starter.

1—5000/2500 Amp., 9/18 Volt Chandeysson MG Set, Direct Connected Exciter, Panel and Starter, 25 Deg. (1946), Like New.

1—2000 Amp., 50 Volt, Chandeysson, 25 Deg. Anodizer, Direct Connected Exciter, Panel and Starter (1954). Like New.

**We have several of the above machines located in Midwest. Priced Right, Available Immediately.**

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WE HAVE THE BEST PRICE FOR
**SCRAP NICKEL ANODES AND CATHODES**
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## BUSS BAR 31¢ LB.

6" wide (some 5") ¼" thick, 8' to 20' long, used copper.

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Acme automatic polisher, 78 spindle, continuous rotary, just overhauled and not used. Table only, no heads. Very reasonable.

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Demineralizer or Chromic Acid recovery System, Permutit.
Sperry Filter Press, Size 30, Type 41.
Rubber lined, Hyd. Closure, 25000 GPH.
20 Acme G-1 & G-3 floating heads 5-15 HP.
3 Gardner Jacks 2-3 HP Motors.
Acme 50' Return type straight line.

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10000/5000 Amp. — 12/24 V.
7500 — 9 V.
2—6000 Amp. — 12 V.
5000 Amp. — 9 V.

**H-VW-M GENERATORS**
15000 Amp. — 9 V.
4000 Amp. — 6 V.

NEW NEVER USED

Hoist Line 19' tanks 4' deep, 9 steel and 2 Koroseal lined.

Detrex Degreasers 33" x 24".
Blakeslee Degreasers 24" x 16".

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6—1500/750 Amp., 9/18 V.
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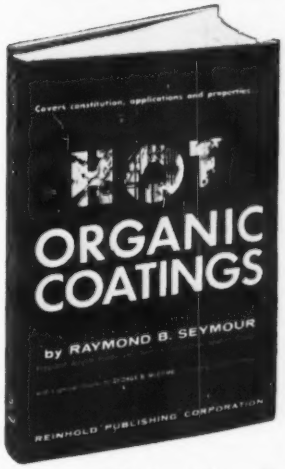
*Covers constitution, applications and properties.*

# HOT ORGANIC COATINGS

**by RAYMOND B. SEYMOUR**
*President, Alcylite Plastic and Chemical Corporation*
**With a special chapter by GEORGE B. McCOMB**
*Consultant to Suppliers of Pipe Line Coatings*

**1959, 244 pages, $7.50**

The constitution, applications and properties of hot organic protective coatings are concisely presented here. The book contains chapters on widely used hot organic materials such as asphalt, coal-tar pitch, petroleum waxes and cellulose derivatives. Specific information on formulations of proprietary products is included. Additional chapters deal with hot melt applications without solvent such as peel coatings, protective linings, flame spraying and the fluidized bed process. One chapter on hot applied coal tar pitch base coatings is supplied by George B. McComb, consultant to the leading suppliers of pipe line coatings. Hot spray techniques and the many advantages of this application are also covered. This book will be helpful to everyone using these coatings in any form.

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**381 Broadway, Westwood, New Jersey**

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## PLATERS AND ANODIZERS

M-G SETS — Motor 3-60-220/440

| Amp. | Volt | Make |
|---|---|---|
| 125 | 40 | Star |
| 200 | 65 | G. E. |
| 300 | 7½ | Hobart |
| 333 | 30 | G. E. |
| 400 | 60/60 | G. E. |
| 500 | 60 | Westinghouse |
| 698 | 47.5 | Elec. Prod. |
| 750 (Twin) | 6 | H-V-W |
| 750/375 | 6/12 | Excell-All |
| 845 | 47.3 | Elec. Prod. |
| 940 | 32 | Elec. Prod. |
| 1000/500 | 6/12 | Chandeysson |
| 1000/500 | 8/16 | Chandeysson |
| 1500/750 | 6/12 | G. E. |
| 1500 | 30/50 | Century |
| 1500 | 40/65 | G. E. |
| 1500 | 65 | Westinghouse |
| 1500 | 70 | Century |
| 2500/1250 | 6/12 | Elec. Prod. |
| 5000/2500 | 6/12 | Columbia |
| 5000/2500 | 9/18 | Chandeysson |
| 7500 | 9 | Elec. Prod. |

SHUNTS

5,000 Amp., 50 mv.
6,000 Amp., 50 mv.
10,000 Amp., 50 mv.
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**Abbey Process Automation, Inc.** 95
37-01 48th Ave., Long Island City 1, N. Y.
**Acme Manufacturing Co.** 6
1400 E. 9 Mile Rd., Detroit 20 (Ferndale), Mich.
**Agate Lacquer Mfg. Co., Inc.** 105
11-13 43rd Rd., Long Island City 1, N. Y.
**Alchemize Corp.** 108
Congress Expressway & S. Kolmar Ave., Chicago 24, Ill.
**Alert Supply Co.**
2041 S. Davie Ave., Los Angeles, Calif.
**Allied Chemical Corp., Solvay Process Div.** 35
61 Broadway, New York 6, N. Y.
**Allied Research Products, Inc.** 13, 34
4004 E. Monument St., Baltimore 5, Md.
**Alvey-Ferguson Co., The**
500 Disney St., Cincinnati 9, Ohio
**American Brass Co.**
Waterbury 20, Conn.
**American Buff Co.** 12
2414 S. LaSalle St., Chicago 16, Ill.
**Apothecaries Hall Co., Div. of The Hubbard-Hall Chemical Co.**
22 Benedict St., Waterbury 20, Conn.
**Armitage & Co., John L.** 94
245 Thomas St., Newark 5, N. J.
**Bacon Felt Co.** 36
437 W. Water St., Taunton, Mass.
**Baker Bros., Inc.** 116
Turnpike St., Route 138, Canton, Mass.
**Baker Co., Alan** 115
180 Sylvester Rd., South San Francisco, Calif.
**Baker Co., The M. E.** 113
25 Wheeler St., Cambridge 38, Mass.
**Barker Bros., Inc.** 101
1660 Summerfield St., Brooklyn 27, N. Y.
**Beam-Knodel Co.** 110
195 Lafayette St., New York 12, N. Y.
**Belke Manufacturing Co** 40
947 N. Cicero Ave., Chicago 51, Ill.
**Better Finishes & Coatings, Inc.** 89
268 Doremus Ave., Newark 5, N. J.
**Blakeslee & Co., G. S.**
1844 S. Laramie Ave., Chicago 50, Ill.
**Brucar Equipment & Supply Co.** 116
602-604 20th St., Brooklyn, N. Y.
**Buckingham Products Co.** 90
14100 Fullerton Ave., Detroit 27, Mich.
**Cadillac Rectifier Div., R.E.P., Electric Products Co.** 109
571 Webster Ave., New Rochelle, N. Y.
**Carbone Corp., The**
Boonton, N. J.
**Chandeysson Electric Co.**
4074 Bingham Ave., St. Louis 16, Mo.
**Chem-Salts, Inc.** 112
P. O. Box 2803, Sta. D, Atlanta 18, Ga.
**Chemical Corp., The** 99
58 Waltham Ave., Springfield 9, Mass.
**Church'll Co., Inc., Geo. R.**
Hingham, Mass.
**Circo Equipment Co.**
51 Terminal Ave., Clark Twp. (Rahway), N. J.
**Clair Manufacturing Co., Inc.** 104
Olean, N. Y.
**Cleveland Process Co.** 87
1965 E. 57th St., Cleveland 3, Ohio
**Clinton Supply Co.** 114
112 S. Clinton St., Chicago 6, Ill.
**Cohn Mfg. Co., Inc., Sigmund** 38
121 S. Columbus Ave., Mt. Vernon, N. Y.
**Columbia-Southern Chemical Corp.**
One Gateway Center, Pittsburgh 22, Pa.
**Conversion Chemical Corp.**
100 E. Main St., Rockville, Conn.
**Crown Rheostat & Supply Co.** 17
1965 Pratt Blvd., Elk Grove Village, Ill.
**Davies Supply & Mfg. Co.** 105
4160 Meramec St., St. Louis 16, Mo.
**Davis-K Products Co.** 92
135 W. 29th St., New York 1, N. Y.
**Dawe's Laboratories, Inc.**
4800 S. Richmond St., Chicago 32, Ill.
**Deering, Milliken & Co., Inc.**
1045 Sixth Ave., New York 18, N. Y.
**Detroit Industrial Process Co.** 111
9301 French Rd., Detroit 13, Mich.
**DeVilbiss Co., The** 102, 103
Toledo 1, Ohio
**Diversey Corp., The** 47
1820 Roscoe, Chicago, Ill.
**Dixon & Rippel, Inc.** 110
Box 116, Saugerties, N. Y.
**Dow Chemical Co., The** 19-22, 42-44
Midland, Mich.
**DuBois Co., Inc., The** 91
1120 W. Front St., Cincinnati 3, Ohio
**Du-Lite Chemical Corp.**
6 River Rd., Middletown, Conn.
**Du Pont de Nemours & Co., E. I.**
Wilmington 98, Del.
**Electro-Glo Co.**
621 S. Kolmar Ave., Chicago 24, Ill.
**Engelhard Industries, Inc., Chemical Div.** 30
113 Astor St., Newark 2, N. J.
**Enthone, Inc.** 3
442 Elm St., New Haven 11, Conn.
**Erie Engine & Mfg. Co.** 38
953 E. 12th St., Erie, Pa.
**Federated Metals Div., American Smelting & Refining Co.** 25
120 Broadway, New York 5, N. Y.
**Formax Mfg. Corp.** 96
3171 Bellevue, Detroit 7, Mich.
**Frank, Paul** 111
118 E. 28th St., New York 16, N. Y.
**G. S. Equipment Co.** 32
15583 Brookpark Rd., Cleveland 35, Ohio
**Glo-Quartz Electric Heater Co., Inc.**
4066 Erie St., Willoughby, Ohio
**Graver Water Conditioning Co.**
216 W. 14th St., New York 11, N. Y.
**Great Lakes Carbon Corp.**
333 No. Michigan Ave., Chicago 1, Ill.
**Grieve-Hendry Co., Inc.**
1421 W. Carroll Ave., Chicago 7, Ill.
**Gumm Chemical Co., Inc. Frederick** Inside Front Cover
538-542 Forest St., Kearny, N. J.
**Hamilton Emery & Corundum Co.** 111
Chester, Mass.
**Hammond Machinery Builders, Inc.**
1601 Douglas Ave., Kalamazoo 54, Mich.
**Hammond Solvents Recovery Service**
241 Brunswick St., Hammond, Ind.
**Handy & Harman** 88
82 Fulton St., New York 38, N. Y.
**Hanson-Van Winkle-Munning Co.** 48
Matawan, N. J.
**Hardwood Line Mfg. Co.** 112
2022 N. California Ave., Chicago 47, Ill.
**Harrison & Co., Inc.** 106
487 Groveland St., Haverhill, Mass.
**Harshaw Chemical Co., The** 33
1945 E. 97th St., Cleveland 6, Ohio
**Heatbath Corp.**
Springfield 1, Mass.
**Heil Process Equipment Corp.**
12901 Elmwood Ave., Cleveland 11, Ohio
**Holland & Sons, Inc., J.** 113
485 Keap St., Brooklyn 11, N. Y.
**Hooker Chemical Corp.** 31
1308 Union St., Niagara Falls, N. Y.
**Hull & Co., Inc., R. O.** 28
1301 Parsons Ct., Rocky River 16, Ohio
**Ideal Chemical Co.** 116
1499 Dean Dr., So. Euclid 21, Ohio
**Illinois Water Treatment Co.** 98
840 Cedar St., Rockford, Ill.
**Industrial Filter & Pump Mfg. Co.** 14
5906 Ogden Ave., Chicago 50, Ill.
**Industrial Instruments, Inc.**
89 Commerce Rd., Cedar Grove, N. J.
**Infilco, Inc.** 24
P. O. Box 5033, Tucson, Ariz.
**Jelco Finishing Equipment Corp.** 97
153 E. 26th St., New York 10, N. Y.
**Kearney Industries, Delanium Graphite Div.** 36
P. O. Box 501, S. Plainfield, N. J.
**Kelite Corp.** 29
81 Industrial Rd., Berkeley Heights, N. J.
**Kocour Company** 110
4802 S. St. Louis Ave., Chicago 32, Ill.
**Kosmos Electro-Finishing Research, Inc.**
140 Liberty St., Hackensack, N. J.
**Kushner, Dr. Joseph B.** 112
621 S. Norman, Evansville 14, Ind.
**Lasalco, Inc.** 11
2820-38 Lasalle St., St. Louis 4, Mo.
**Lea Mfg. Co.** 85
16 Cherry Ave., Waterbury 20, Conn.
**Lea Michigan, Inc.** 108
14459 Wildemere, Detroit 38, Mich.
**Lea-Ronal, Inc.** 86
139-20 109th Ave., Jamaica 35, N. Y.
**L'Hommedieu & Sons Co., Chas. F.** 5
4521 Ogden Ave., Chicago 23, Ill.
**Lindale Equipment & Supply Corp.** 113
504 Smith St., Brooklyn 31, N. Y.
**Lowe Brothers Co., The** 23
Dayton 2, Ohio
**Macarr, Inc.**
4360 Bullard Ave., Bronx 66, N. Y.
**MacDermid, Inc.** Back Cover
Waterbury 20, Conn.
**Magnus Chemical Co., Inc.**
11 South Ave., Garwood, N. J.
**Mahon Co., The R. C.**
Detroit 34, Mich.
**Manhattan Rubber Div., Raybestos-Manhattan, Inc.**
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**Manning, Maxwell & Moore, Inc. Consolidated Ashcroft Hancock Div.**
Stratford, Conn.
**Meaker Company, The**
1633 S. 55th Ave., Chicago 50, Ill.
**Metal Finish, Inc.**
408 Frelinghuysen Ave., Newark, N. J.
**Metel & Thermit Corp.** 26, 78-81
Rahway, N. J.
**Michigan Buff Co., Inc.** 114
3503 Gaylord Ave., Detroit 12, Mich.
**Motor Repair & Mfg. Co., The** 116
1555 Hamilton Ave., Cleveland 14, Ohio
**Murray-Way Corp.**
P. O. Box 180, Maple Rd. E., Birmingham, Mich.
**Nankervis Co., Geo. L.**
15300 Fullerton Ave., Detroit 27, Mich.
**National Polymer Products, Inc.**
2120 Fairmount Ave., Reading Pa.
**Naxar Rubber Co., The** 112
2727 Avondale, Toledo 7, Ohio
**New Holland Machine Co.** 109
New Holland, Pa.
**Nordson Corp.**
Jackson St., Amherst, Ohio
**Northwest Chemical Co.** 27
9310 Roselawn Ave., Detroit 4, Mich.
**Norton Co.** 39
1 New Bond St., Worcester 6, Mass.
**Nuodex Products Co.** 41
Elizabeth, N. J.
**Oakite Products, Inc.** 4
18 Rector St., New York 6, N. Y.
**Packer Machine Co.**
456 Center St., Meriden, Conn.
**Perma-Line Rubber Products Corp.**
1753 N. Winnebago Ave., Chicago 47, Ill.
**Pesco Plating Equipment Corp.** 114
75 Wythe Ave., Brooklyn 11, N. Y.
**Pfizer & Co., Inc., Chas.** 10
630 Flushing Ave., Brooklyn 6, N. Y.
**Phelps Dodge Refining Corp.** 93
300 Park Ave., New York 22, N. Y.
**Plating Products, Inc.** 100
1509 N. Washington, Kokomo, Ind.
**Plating Service & Equipment Corp.** 114, 117
3620 Hart St., Detroit 14, Mich.
**Ramco Equipment Corp.**
807 Edgewater Rd., New York 59, N. Y.
**Randolph Products Co.**
92 N. 12th St., Carlstadt, N. J.
**Rapid Electric Co.** 7
2881 Middletown Rd., Bronx 61, N. Y.
**Raybestos-Manhattan, Inc. Manhattan Rubber Div.**
Passaic, N. J.
**Reliable Industrial Equipment Co.** 115
633 Richmond St., Grand Rapids 4, Mich.
**Robertshaw Fulton Controls Co., Fulton Sylphon Div.**
Knoxville 1, Tenn.
**Rona Laboratories, Inc.**
E. 21st & E. 22nd Sts., Bayonne 3, N. J.
**Sandoz, Inc.**
61 Van Dam St., New York 13, N. Y.
**Saran Lined Pipe Co.**
2415 Burdette Ave., Ferndale 20, Mich.
**Schaffner Mfg. Co., Inc.** 111
22 Herron Ave., Emsworth, Pittsburgh 2, Pa.
**Sel-Rex Corp.** Inside Back Cover
75 River Rd., Nutley 10, N. J.
**Servi-Sure Mfg. Co.**
131 N. Green St., Chicago 7, Ill.
**Sethco Mfg. Co.** 96
2286 Babylon Turnpike, Merrick, L. I., N. Y.
**Siefen Co., J. J.** 16
5643 Lauderdale, Detroit 9, Mich.
**Simonds Abrasive Co.**
Tacony & Fraley Sts., Philadelphia 37, Pa.
**Smith Co., Paul T.**
668 Eddy St., Providence 3, R. I.
**Solvents Recovery Service** 112
1025 Broad St., Newark 2, N. J.
**Sommers Bros. Mfg. Co.** 112
3439 No. Broadway, St. Louis 7, Mo.
**Special Chemicals Corp.** 106
100 S. Water St., Ossining, N. Y.
**Stevens, Inc., Frederic B.** 18
1808 - 18th St., Detroit 16, Mich.
**Stokes Corp., F. J.**
5500 Tabor Rd., Philadelphia 20, Pa.
**Storts Welding Co., Inc.** 107
38 Stone St., Meriden, Conn.
**Stutz Co., The** 46
4430 W. Carroll Ave., Chicago 24, Ill.
**Surety Rubber Co.**
Carrollton, Ohio
**Technic, Inc.** 45
39 Snow St., Providence, R. I.
**True Brite Chemical Products Co.** 107
P. O. Box 31, Oakville, Conn.
**Turco Products, Inc.**
24600 S. Main St., Wilmington, Calif.
**Udylite Corp., The** 8, 9, 37
Detroit 11, Mich.
**Unit Process Assemblies, Inc.**
61 East 4th St., New York 3, N. Y.
**U. S. Galvanizing & Plating Equipment Corp.**
31 Heyward St., Brooklyn 11, N. Y.
**U. S. Stoneware**
Akron 9, Ohio
**Univertical Foundry & Machine Co.** 104
14841 Meyers Rd., Detroit 27, Mich.
**Virginia-Carolina Chemical Corp.**
401 E. Main St., Richmond 8, Va.
**Worklon, Inc.**
253 W. 28th St., New York 1, N. Y.
**Worthy Products Co.** 116
Box 123, Temple, Pa.
**Wyandotte Chemicals Corp.** 15
Wyandotte, Mich.
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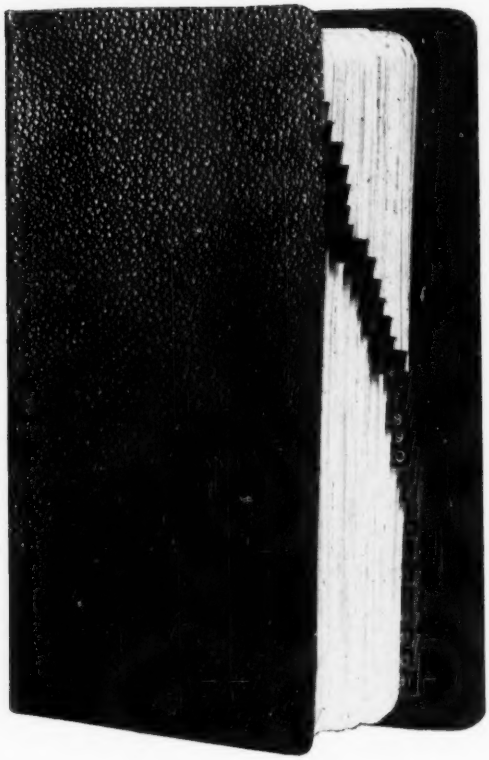

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